Published May 25, 1943

Serial No. 337,853

377,395

ALIEN PROPERTY CUSTODIAN

REFRIGERATOR BOXES

Rudolf Hintze, Berlin-Charlottenburg 9, Germany; vested in the Alien Property Custodian

Application filed May 29, 1940

This invention relates to improvements in refrigerator boxes and more particularly to refrigerator boxes of the household type.

Refrigerator boxes are, as a rule, so designed that the cooling chamber is insulated against the outside atmosphere by an insulating material arranged between the inner casing and an outer casing of sheet metal. The refrigerator boxes of the above-mentioned character are in most cases provided with suitable inner stiffening members for the outer sheet metal casing. Thus a wooden frame work serving to stiffen the entire refrigerator box is in most cases employed. Refrigerator boxes are also well known in which the lateral walls of the refrigerator sheet metal casing are reenforced by a plurality of sheet metal walls.

The object of the present invention is to provide a refrigerator box of the above-mentioned character in which the refrigerator outer casing need not be stiffened in the manner as has hitherto been usual. This may be accomplished according to the invention in such a manner that the two sheets are so deep drawn as to form the two lateral walls of the outer casing of the refrigerator box, the sheets being secured together at the front side by wall portions arranged above and below the door and at the rear of the refrigerator by a wall portion forming the rear wall. The lateral walls of the refrigerator box thus formed have a sufficient mechanical strength so that an additional stiffening of the lateral walls is not necessary. The refrigerator box is preferably so designed according to the invention that when manufacturing the outer casing of the refrigerator, the lateral sheets forming the outer casing are so deep drawn as to extend in the upward direction beyond the insulation of the cooling chamber and thus form the lateral walls of the machine compartment arranged above the cooling chamber. Similarly, the sheets forming the lateral walls may also be extended in the downward direction beyond the insulation of the cooling chamber so as to form below the latter the outer lateral walls of a non-insulated storage receptacle for receiving non-perishable articles. The other wall portions necessary for the outer sheet metal casing may be designed in a very simple manner; the portions may, for instance, be so shaped that the machine compartment is closed at the front side and at the top by a cover made of one piece. Similarly, also the rear wall of the refrigerator box and the bottom of the non-insulated storage receptacle may be made of one piece.

As is well known, when the sheet has been deep drawn to the desired shape there remains a flange bent at right angles. The latter is employed to center the wall portions of the refrigerator arranged adjacent to the lateral walls or to secure the same by means of screws, rivets or by welding or the like.

An embodiment of the invention is shown in the accompanying drawings. Figs. 1 and 2 show two longitudinal sectional views of a refrigerator box according to the invention. Fig. 3 shows a front view of the refrigerator. Figs. 4 and 5 show horizontal sectional views along the lines A—A and B—B of Figs. 1 and 2 respectively. The refrigerator is equipped with a refrigerating apparatus of the compression type. 1 denotes the cooling chamber, 2 the machine compartment arranged above the cooling chamber. 3 is a non-insulated storage receptacle for receiving non-perishable articles arranged below the cooling chamber. The insulation 4 for the cooling chamber is arranged between the inner casing 5 and an outer sheet metal casing. The outer sheet metal casing consists of two lateral walls 6 and 7, of two wall portions 8, 9 arranged at the side of the door, of a part 10 which forms at the same time the rear wall and the bottom of the non-insulated storage receptacle 3 and of a cover 11 for the machine compartment 2.

The side walls 6 and 7 consist of sheet metal bent in a downward direction so as to form the strengthening necessary for the refrigerator. Particular inner reenforcements by wooden parts are therefore not necessary. The flanges 12 serve to center the cover 11 and the flanges 13 to secure the rear wall 10 provided with corresponding flanges 14. 15 denotes the door frame. In the latter a slot 16 is provided above the door through which pass the refrigerant conduits and under circumstances the control conduits (not shown) extending from the machine compartment to the evaporator. 18 denotes bolts secured to the ceiling of the cooling chamber and serving to hold the evaporator (not shown) in position.

The non-insulated storage receptacle arranged below the cooling chamber may be closed by means of a flap 19 provided with a handle 20. The lower part 21 of the refrigerator is designed in the form of a solid wooden base. The inner walls 22 of the non-insulated storage receptacle form a support resting on the wooden base 21.

The insulation of the cooling chamber 1 is closed with respect to the machine compartment by means of a cover plate 23 resting on angle irons 24 secured to the lateral walls 6 and 7 of the refrigerator box. A corresponding lower plate 25 rests on the angle irons 26.

RUDOLF HINTZE.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. HINTZE
REFRIGERATOR BOXES
Filed May 29, 1940

Serial No.
337,853
2 Sheets-Sheet 1

Fig. 1

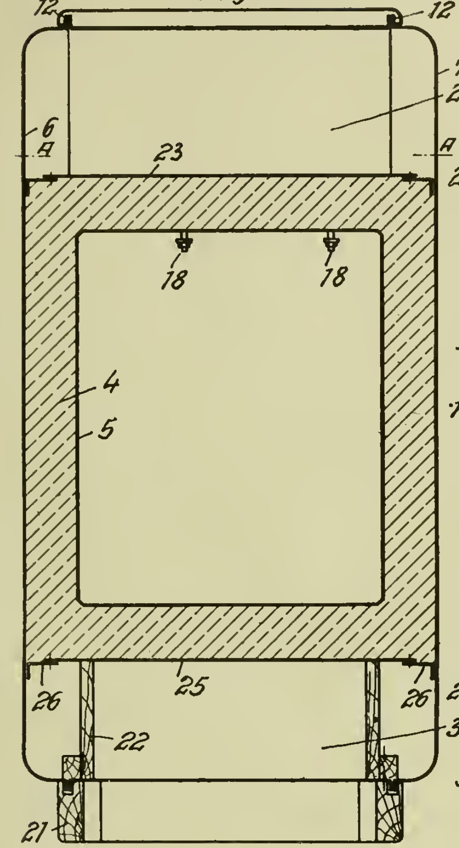


Fig. 2

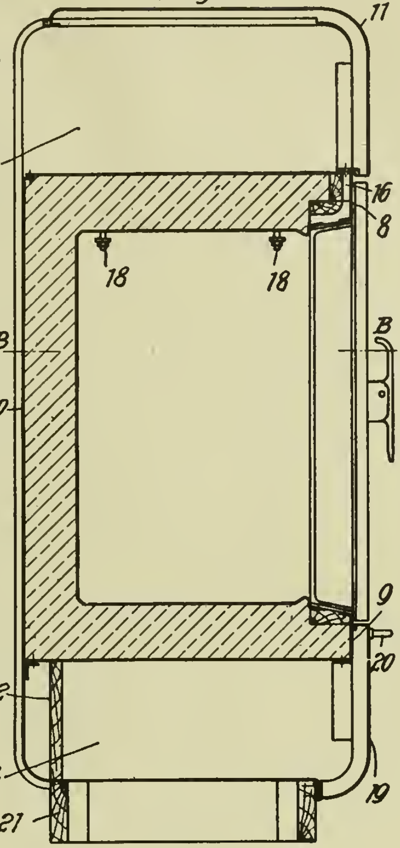
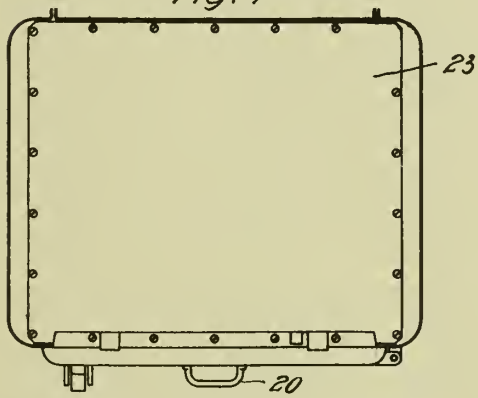


Fig. 4



Inventor
Rudolf Hintze
by Knight Bro
Attorneys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. HINTZE

REFRIGERATOR BOXES

Filed May 29, 1940

Serial No.
337,853

2 Sheets-Sheet 2

Fig. 3

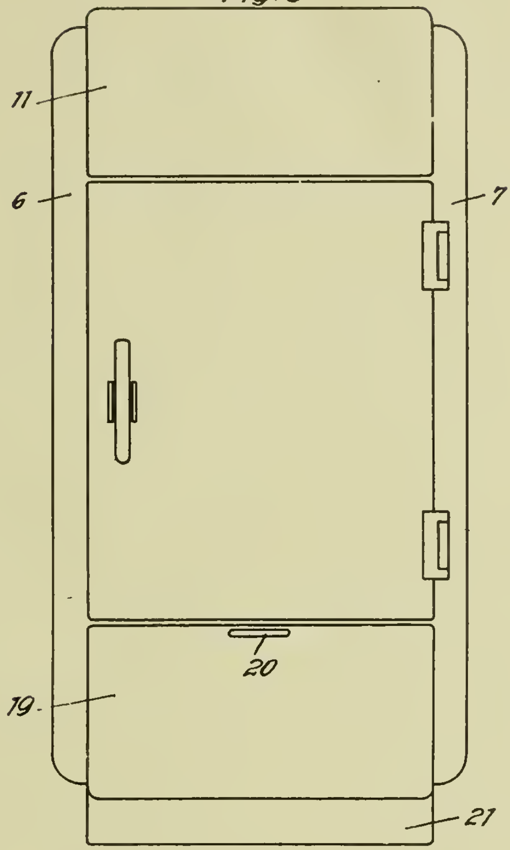
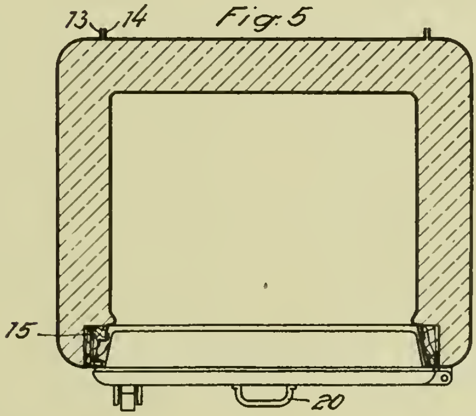


Fig. 5



Inventor
Rudolf Hintze
by
Knight Bros
Attorneys

Published May 25, 1943

Serial No. 338,272

ALIEN PROPERTY CUSTODIAN

BOOKING MACHINE, PARTICULARLY TYPEWRITING - CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

Robert Anschütz and Ernst Hugo Kämmel, Zella-Mehlis, Thuringia, Germany; vested in the Alien Property Custodian

Application filed May 31, 1940

This invention relates to an accounting machine, particularly a typewriting-calculating machine equipped with total-taking mechanism.

Numerous devices have already been proposed with a view to also carry out multiplications on typewriting-calculating machines, since only then a really useful accounting-machine would be obtained. With the machines of this kind on the market the multiplication was carried out by a device consisting of certain contacts and magnets. This, however, proved to be a constant source of trouble which developed with the electric circuits and was difficult to locate and remove.

These disadvantages are eliminated according to the present invention by a control device which makes ineffective the operation of the counting mechanism, already known, during addition and subtraction and operates the counting mechanism for a multiplication device which can be attached to the machine in one unit. In the drawings a constructional example of the device according to the invention is illustrated:

Fig. 1 is a left front perspective view of a typewriting calculating machine according to the invention.

Fig. 2 is a left side view of the typewriting-calculating machine in which for better display of the single parts the coverplate as well as the multiplication device have been omitted, also the machine frame is shown partly interrupted.

Fig. 3 is a left side view of the machine, according to fig. 2, in which mainly the calculating features are shown.

Fig. 4 shows a portion of fig. 3 in which some parts are illustrated in operating position.

Fig. 5 is a front view of the preparatory device for the multiplication in rest position, some parts have been interrupted.

Fig. 6 is a front view similar to fig. 5. in which the preparatory device for the multiplication is shown in operative position.

Fig. 7 is a plan view on the preparatory device according to fig. 5 in rest position.

Fig. 8 is a plan view on the preparatory device according to fig. 5, in operative position.

Fig. 9 is a right front perspective view of the preparatory key and the parts controlled by same.

Fig. 10 is a left front perspective view of further parts of the preparatory device for the multiplication with some parts remote from each other.

Fig. 11 is a plan view on the base part of the machine with some parts interrupted.

Fig. 12 is a left front perspective view of single calculating-units as well as the locking device for the counting slides and some control parts for the locking device.

Fig. 13 is a left side view of some control parts for the mechanism for introducing the formation of values, in rest position.

Fig. 14 is a left side view of the device for introducing the formation of values, in the preparatory position.

Fig. 15 is a front view of the parts, according to fig. 14.

Fig. 16 is a left side view of the device, according to fig. 14, showing some parts, however, in the position in which they have released the control clutch for the total-taking mechanism for operation.

Fig. 17 is a left side view of the device according to fig. 14, showing some parts in non-operative position.

Fig. 18 is a left front perspective view of several adjustment- and control parts for the device for forming the values, in which for obtaining a better view some parts are shown remote from each other as well as interrupted.

Fig. 19 is a left front perspective view of some gears of the total-taking mechanism, in which for better illustration some parts are shown remote from each other as well as interrupted.

Fig. 19*a* is a detail of fig. 19.

Fig. 20 is a left side view of some parts shown in fig. 19.

Fig. 21 is a front view of the parts according to fig. 20.

Fig. 22 is a left front perspective view of the recording device of the total-taking mechanism, in which for clearer view some parts are shown remote from each other as well as interrupted.

Fig. 23 is a diagrammatic view of the device for introducing the value of the multiplication feature of the typewriting-calculating machine.

General description of the machine

The typewriting-calculating machine consists essentially of a frame **2**, figs. 2 and 3 which is arranged inside of a cover-plate, fig. 1, and supports the typewriting-calculating mechanism. A paper carriage **5** is mounted to slide on the rails **3** and **4** of the frame **2**. A number of column totalizers and idle totalizers **7** and **8** are suspended at a predetermined place from the suspension rail **6** which is attached to the paper carriage **5**. A calculating mechanism **9** is mounted on the front side of the frame **2**. The addition- and subtraction values can be introduced into the column totalizers **7** by means of the cal-

culating keys 10 and the control clutches 29, 30, 31, fig. 3, cooperating with same. For the purpose of automatically registering a sum which has been calculated in one of the column totalizers 7, a total-taking mechanism according to Patent-application Ser. Nr. 146,897 has been provided within and at the frame 2 or within and at the calculating mechanism 9, this total-taking mechanism can be controlled by a total-taking key 11 by way of the control clutches 233, 234, 235, fig. 2. The keys 10 and 11 as well as their control clutches are arranged in a storage frame 12 located below the frame 2, figs. 2, 3, 11. A decimal tabulator keyboard 13, figs. 1 and 3, located at the same place, makes it possible to tabulate the paper carriage 5 into the required position.

For the multiplication of two values according to the invention a preparatory device for multiplication which is controlled by the key 14 as well as a multiplying mechanism which is controlled by the key 15 have been provided inside and outside (that is to say, to the right and left) of the storage frame 12. A motor, not shown, which is attached to the right side of the frame 2, by means of the respective gears serves to start the various devices controlled by the keys 10, 11, 14, 15 as well as the printing mechanism and the automatic carriage sliding.

For better understanding the present invention it is suggested to carry out the normal procedure of calculating addition- and subtraction values as follows:

Normal calculating- and printing procedure when additive values are introduced

Assuming by way of example that the value "5" shall be introduced additively into one of the column totalizers 7. After the paper has been placed in the machine the paper carriage 5 by depressing the respective tabulator key of the decimal Tabulator keyboard 13 is tabulated to that place where the calculating place of the column totalizer 7 mentioned above receiving the value "5" is in operative position. When the column totaliser 7 has been placed into the chosen operative position the control bar 16, Fig. 3, engages the lug 17, Fig. 12, of the catch lever 18 which normally locks the parts of the calculating mechanism 9 and moves the catch lever 18 around the shaft 20 in the direction of arrow 19. Simultaneously the lug 21 of the catch lever 18 leaves the recess 22 of the finger 25 rigidly mounted on the shaft 24. Now, the calculating key 10, Figs. 3 and 12, which corresponds to the figure "5" is depressed and thereby the key lever 26 as well as the catch lever 27, which is mounted to slide on the same and holds the calculating key in depressed position, are moved clockwise around the shaft 28. Consequently the control clutch 29, 30, 31 which cooperates in known manner with the key lever 26 of the figure "5" is coupled with the driving shaft 33, which is constantly driven by the motor in the direction of arrow 32, for a complete revolution. When the control clutch 29, 30, 31 is turned, the counting slide 35 which has been in constant driving connection with the cam 30 by the springs 34, follows the declining part of the cam 30 so that the counting slide 35 is therefore descending vertically. At the beginning of the downward movement the decline 36, Fig. 3, of the counting slide 35 acts upon the ledge 37 whereby the parts 38, 24, 25, 39, are moved in the direction of arrow 40. In this manner on the one hand by the finger 39 that particular calculating place of the column totalizer 7 which is just in operative position is prepared for receiving the value and, on the other hand, the lock 24*a*, 41, Fig. 19, is released. During the continued declining movement of the counting slide 35, the curved slot 35*a* by means of the usual counting members 42 till 51 and 41, Figs. 3 and 19, which have already been coupled in the known manner in dependence of the described movement of the shaft 24, introduces the value "5" into the calculating place of the vertical counting mechanism 7 tabulated in operative position.

Shortly before the counting slide 35 has finished its declining move, its lug 52, Fig. 3, engages the printing key lever 53 which corresponds to the figure "5" and moves the same clockwise around the rail 54. In this way, by means of the intermediate member 55, the driving connection is made between the lever gears 56, 57 of the type lever 58 of the figure "5" and the cam shaft 59 which is constantly driven by the motor in a clockwise sense. Simultaneously the type lever 58 with the figure "5" is brought to print upon the paper located before the typing roller of the paper carriage 5 in known manner. Upon receding of the type lever 58 then follows the usual switching of the carriage. During the continued turning of the control clutch 29, 30, 31, the rising part of the cam 30 again engages the counting slide 35 and causes it to be moved upwards and back again into its original position against the action of the springs 34. All the rest of the gears are returned into rest position in like manner. Simultaneously at the completion of a full turn the control clutch 29, 30, 31 is released again from the driving shaft 33 and the levers 26, 27 are moved back into rest position.

The calculation procedure described above is known in all its details and has been resumed only for better understanding of the present invention described as follows:

The multiplicant as well as the multiplicator are simultaneously introduced by the calculating keys 10 when carrying out a multiplication on the typewriting-calculating machine. The customary calculating mechanism 9 of the typewriting-calculating machine is not suited for a multiplication since no calculation of a value having several places, for instance, a multiplicant with a value having several places, for instance, a multiplicator is possible, but only the decimal formation of a value introduced by places is possible by transferring the introduced value decimally to the column totalizer which happens to be in operative position.

Therefore the multiplicant and multiplicator are introduced into a multiplying mechanism which is conveniently arranged at the left beside the machine frame 2 and 12 in a suitable manner. But these features do not represent the object of the present invention so that they need not be discussed any further. When introducing the multiplicant and the multiplicator into this multiplying mechanism by means of the customary calculating keys 10 of the typewriting-calculating machine, it is necessary, of course, to eliminate the mechanism for introducing additive and subtractive values as described above for the reason that when a calculating key 10 is depressed its corresponding value can be introduced only into one column totalizer 7 through the counting slides 35. For this reason the preparatory key 14, Fig. 1, is struck be-

fore beginning to introduce the multiplicant as well as the multiplicator, whereby the mechanism described in the following is controlled.

Arrangement of a preparatory mechanism for the multiplication

A control mechanism **26**, **27**, **29**, **30**, **31**, Figs. 11 and 12, cooperating with each calculating key **10** of the Figures "0–9" and corresponding to the control mechanism **60**, **61**, **62**, **63**, **64**, Figs. 7 and 9, has been arranged to the right outside the frame **12**. For this purpose the driving shaft **33** and the supporting shaft **28** have been extended to the right so that the right end of the supporting shaft **28** is held by a bracket **65** and the right end of the driving shaft **33** is held by a bracket **66**. Both brackets **65** and **66** are bolted to the angle piece **67**, which is U-shaped at its rear end, by means of the bolts **68** and **69**. The angle piece **67** itself is bolted to the right sidewall of the supporting frame **12** by means of the bolts **70**. At this side of the supporting frame **12** a guide-angle piece **72**, Fig. 5, has been attached by the bolts **71** and the key lever **60** of the control mechanism **60** till **64**, Fig. 9, is operated in its slot **73**. At the front end of this key lever **60** is the key button **14** bearing the inscription "preparatory key". The cam **63**, Fig. **9**, of the control lever **62**, **63**, **64** cooperates with a roller **74** which is mounted for rotation on a double-arm lever **75**. The latter is arranged to swing around a headed screw **77** fastened in a socket **76** of the supporting angle piece **67** and constantly tends to move in the direction of arrow **79** by the pull of the spring **78**, so that its roller **74** is constantly kept in touch with the circumference of the cam **63**. A tie rod **81** is jointed to the downward arm of lever **75** by means of the bolt **80**. This tie rod **81** is also jointed to the shorter arm of an angle lever **83** by means of the bolt **82**. The angle lever **83** is mounted for rotation on a headed screw **84** at the bottom side of the supporting angle **67**. A tie rod **86** engages in a bore hole **85**, Figs 5 till 9, of the longer arm of the angle lever **83** and is held in place by the nut **87**. This tie rod extends across the length of the machine frame **2**, **12** and with its left end engages in a bore hole **88**, Figs. 5, 7 and 10 of a slide **89**, where it is also secured by the nut **90**. The slide **89** can be moved horizontal to the bevelled lug **91** of a guide member **92**, which is facilitated by the headed screw **94** screwed in the lug **91** and extending through a guide slot **93** of the slide **89**. The guide member **92** is bolted by the screws **95** to the front wall of a frame **96** which is again rigidly connected with the supporting frame **12** by the connecting bars **97**, Figs. 2 and 8. A multiplication mechanism which lies outside the scope of the present invention is also arranged in and at this frame **96** in the most suitable manner.

The slide **89** is connected by its bevelled lug **98**, Figs. 5, 6, 7, 8 and 10, with a suitably designed slide **100** according to Fig. 10, by means of the screw **99**. The slide **100** is mounted for sliding horizontally in the frame **96** by means of longitudinal slots **101** through which the headed screws **102** extend. Under the action of the spring **78**, Fig. 9, the slide **89**, Fig. 10, by way of the members **75**, **81**, **83** and **86** as well as the slide **100** constantly tend to move in the opposite direction of arrow **103** and simultaneously when in rest position the right edges of the guide slots **93** and **101** will be placed alongside of the headed screws **94** and **102** extending through them. A lug **105** is provided at a rearwardly extending arm **104** of the slide **100**. When the slide **100** is moving towards the right,- the lug **105** is able to engage with a lug **106***a* of a locking lever **107** which by means of the pivot **108** is mounted for rotation on a supporting member **109** bolted to the frame **96** and tends to move in direction of the arrow **111** by the spring **110**, while in rest position, the bevelled lug **112** of the locking lever **107** lies close to the base part of the supporting member **109**.

A lug **113** is provided at the slide **100**, Fig. 10. This lug **113** is able to cooperate with a bevel **114** of a pawl **115** which by means of pinion **116** is mounted for rotation on a lever **117**. The pawl **115** tends to move clockwise by the action of the spring **118**, when in rest position a bevelled lug **119** of the pawl **115** is placed on the upper edge of the lever **117**. The lever **117** is mounted to swing on the front wall of the frame **96** by means of a pinion **120** and is guided in the slot **121** of the guide member **92**. A part **123** is jointed to the right end of the lever **117** by a screw **122**. The forward end of a lever **125** is jointed to the member **123** by a screw **124**. The lever **125** is mounted to swing on a left extension **28***a* of the supporting shaft **28** and tends to move anti-clockwise, Fig. 10, by the pull of the spring **126** until such movement is stopped by the projection **127** striking against the edge **128** of a member **130**, Figs. 5 and 10. The latter is bolted to the lever **125** in a slot **131** and guided by the supporting angle piece **132**. This angle piece **132** is rigidly fastened to the frame **96** by the screws **133**, Figs. 5 and 6. A catch pawl **135** is mounted to swing on the lever **125**, Fig. 10, by the pinion **134**. One end of a tension spring **137** is fastened in a bore hole **136** of the catch pawl **135**, whilst its other end is suspended from a bore hole **138** of the lever **125**. By the action of the spring **137**, the catch pawl **135** constantly tends to move clockwise and its normal position is fixed by the lug **139** striking against the ratchet **140** which is fastened to the supporting frame **12** as well as to the frame **96**. The lug **139** of the catch pawl **135** is able at the proper moment to engage in a notch **141** of the ratchet **140**. Certain members to be discussed later under the heading "Preparation for a device to be used as clutch for the total taking mechanism" are mounted to the downward flanged arm **142** of the lever **125**.

The lever **125** during its clockwise movement around the shaft **28***a* is able to engage by its lower edge **143** with a pin **144**. The latter is fastened in a member **145**, Figs. 5, 7, 10, 12, which is jointed to a lever **147** by a screw **146**. The lever **147** is mounted to swing by its hub **148** around a pinion **149** which is screwed in the left sidewall of the machine frame **2**. A bar **151** is jointed to the lever **147** by the screw **150**. A headed screw **153** which is screwed in the machine frame **2**, protrudes through a longitudinal slot **152**, Fig. 12, of the bar **151**, whereby the latter can be moved up and down at the machine frame **2**. The lever **147** is moved anti-clockwise around the screw **149** by the action of the tension spring **154** and consequently the bar **151** is moved downwards and its normal position fixed by the upper edge of the slot **152** of the bar **151** striking against the headed screw **153**. The bar **151** at its upward pointed end has an opening **155** through which protrudes a flanged lug **156** of a lever **157** which by the pin **158** is mounted to swing on a support-

ing member 159 fastened in the calculating frame 9, Fig. 2. A slide 161 is jointed to the lever 157 by means of a screw 160c. The right end of this slide 161 is connected with the known ratchet 162 which is arranged to slide in the frame 9 of the calculating mechanism. The teeth 163 of the ratchet 162 are able to engage in the longitudinal slots 164 of the known ten counting slides 35, referring to the figures "0" to "9" (in Fig. 12 only one counting slide is illustrated). A member 166 is fastened to the ratchet 162 by screws 165. The oblique part 167 of the member 166 is able to engage the upper edge 168 of the pawl 18 which normally locks the operative members of the calculating mechanism.

Operation of the preparatory mechanism for the multiplication

To carry out a multiplication, the paper carriage 5, Fig. 1, of the machine, which is supposed to be in the right-hand position, is first tabulated into the corresponding decimal place with the respective column totalizer in which the multiplicand shall also be introduced, besides its introduction into the multiplicand apparatus 242 of the multiplication mechanism illustrated in Fig. 23. If, however, the retaining of the multiplicand of the multiplicator in the column totalizers is not required, the latter are replaced by zero totalizers on the totalizer suspension rail 8. Then the preparatory key 14 is depressed, whereby the key lever 60 and the slide 61, Fig. 9, are moved anti-clockwise around the shaft 28. Consequently the control clutch 62, 63, 64 is connected in known manner for a complete turn with the driving shaft 33 which is moved in the direction of arrow 32. During the first half-turn of the control clutch 62, 63, 64 the rising curved part of the cam 63 engages the roller 74 of the lever 75 and moves it around the pinion 77 in the reverse direction of arrow 79 and against the action of the spring 78. In this way the draw hook 81 is moved in the direction of arrow 170, Figs. 7 to 9, whereby the angle lever 83 tends to move anticlockwise around the pivot 84 from the position illustrated in Fig. 7 into the position illustrated in Fig. 8. Simultaneously the angle lever 83 pulls the draw-bar 86 in the direction of arrow 103. The draw-bar 86, Figs. 5 to 8 and 10, therefore tends to move the slide 89 and through same also the slide 100 in the same direction towards the right. During this sliding movement of the slide 100 the incline of the lug 113 cooperates with the incline 114 of the pawl 115 and through the driving connection 119, 117 moves the lever 117 clockwise around the pivot screw 120. Simultaneously the lever 117 moves the member 123 downwards and the latter owing to the screw connection 124, moves the lever 125 clockwise around the shaft 28a against the spring 126. Its lower edge 143 also engages the pin 144 of the member 145, Figs. 10 and 12, whereby the member 145 is moved downwards and consequently the lever 147 is moved clockwise around the pivot screw 149, Fig. 12, against the spring 154.

During the clockwise movement of the lever 147, the bar 151, Fig. 12, is pushed upwards and through the driving connection 155, 156, also tends to move clockwise the lever 157 around the screw 158. Consequently the slide 161 is moved in the direction of arrow 103. The slide 161 also moves the ratchet 162 in the same direction, whereby the notches 163 of the ratchet 162 engage in the longitudinal slots 164, Fig. 6, of the ten counting slides 35 (in Fig. 6 only three counting slides are illustrated) and prevent the counting slides 35 from moving downwards.

When the slide 100, Fig. 10, is moved towards right and reaches the point where the lug 113 has attained the highest point of the incline 114 of the pawl 115, the movement of the members 117, 123, 125, 145, 147, 151, Fig. 12, 157, 161 and 162 has also been completed. At this moment, by the action of the tension spring 137, Fig. 10, which is fastened to the lever 125 and to the catch pawl 135, the catch pawl 135 of the lever 125 by its lug 139 engages in the locking notch 141 of the ratchet 140 and in this way holds the lever 125 as well as the members 117, 123, 145, 147, 151, 157, 161 and 162 in the position illustrated in Fig. 6.

When the slide 100 is moved further towards right its lug 105 also engages the bevel edge 106a, Fig. 10, of the lug 106 of the catch lever 107, whereby the latter tends to move against the action of its spring 110 in the opposite direction of arrow 111 and is held in this position until the lug 105 releases the lower edge 106b of the lug 106 of the catch lever 107. As soon as the lug 105 releases the lug 106, the catch lever 107 owing to the tension of the spring 110 snaps back into its rest position according to Fig. 10 and thereby is moved by its lug 106 in front of lug 105 of the slide 100 which in this way is prevented from moving towards left. At this moment the highest point of the raised curved part of the cam 63, Fig. 9, of the control clutch 62, 63, 64 has been moved to a place opposite the roller 74, whereby the lever 75 as well as the members 81, 83, 86, 89 and 100 connected with it, have completed their prescribed movement and are held in this position owing to the above mentioned locking mechanism 106, 105, Figs. 6 and 8.

The control clutch 62, 63, 64 now completes the remaining turn of a complete revolution without engaging any other members. After completion of the full revolution, the levers 60, 61 are then moved back into rest position in known manner and the control clutch 62, 63, 64 is again released from the driving shaft 33.

Simultaneously with the elimination process of the customary calculation of additive or subtractive values when striking a calculation key 10, as described above and further explained under the heading "Normal calculating- and printing process during the introduction of additive values," according to the present invention a suitable device has been constructed which moves the mechanism for introducing the value of the multiplicand and multiplicator into operative position. In order to introduce the values of the multiplicand and multiplicator, according to the present invention the customary device for automatic zero-printing of column totalizers, as described in Patent application Ser. Nr. 146897, is also made use of. The real process of introducing the values will be described in detail under the heading "Introduction of values." In the following shall be explained for the present the preparation of that mechanism which is designed to connect the total-taking mechanism described in the above-mentioned patent with the driving mechanism in dependence of the striking of the calculating keys.

Preparation of a device for connecting and disconnecting the total-taking mechanism

The screws 172 are attached to the downward extending arm 142, Figs. 10 and 13, of the lever

125 and protrude through the longitudinal slots 173 of a slide 174. A pin 175 is riveted to the slide 174 and a spring 176 is attached with one end to the pin 175 and with its other end to the pin 177 which is attached to the arm 142 of the lever 125. The slide 174 constantly tends to move in the direction of arrow 170 by the action of the spring 176 until the front edges 173*a* of its longitudinal slots 173 strike against the screws 172, Fig. 13. The slide 174 is able to engage by its rear edge 178 with the lug 179 of a second slide 180. The slide 180 is arranged to move back and forth on a member 183 on which the screws 181 protrude through the longitudinal slots 182. The member 183 is fastened by its fulcrum 184, Figs. 15 and 18, to the shaft-end 186 which is resting in bore-holes 185 of an auxiliary member 185 which supports the frame work 12. A lever 188 is rigidly mounted at the right and of the shaft end 186 by its fulcrum 187. One end of a tension spring 190 is attached to a pin 189, Fig. 18, which is riveted in the slide 180 whilst the other end of the spring 190 is attached to the pin 191 which is attached to the lever 125, Fig. 13. By the action of this spring 190, the members 180, 133, 186 and 188 constantly tend to move clockwise, Fig. 13, until such movement is checked by the upper edge of the member 183 striking against a stop 192 which is screwed in the supporting member 185. Simultaneously owing to the action of the spring 190, the slide 180 tends to move in the opposite direction of arrow 170 causing the lug 179 of the slide 189 to be in constant contact with the rear edge 178 of the slide 174.

The slide 174 by the action of the spring 176 also participates in the clockwise movement of the lever 125, Figs. 10 and 13, around the supporting shaft 28*a*, as described, which movement is controlled in dependence of the operation of the preparatory key 14. The slide 174 with its rear edge engages the lug 179 of the slide 180 and moves same against the action of the spring 190 in the direction of arrow 170, Fig. 14. As a consequence, a rearwardly directed lug 193 of the slide 180 is moved into the path way of an abutted lug 194 of a shaft 195. This shaft 195 is mounted in a swing-frame 197 which swings around the supporting shaft 196, Fig. 2, and with its left end protrudes through a longitudinal slot 198, Fig. 13, in the supporting member 185. This driving connection 194, 193, which is also activated by depressing the preparatory key 14 for the multiplication, is maintained in upright position owing to the locking notch 139, 141 which engages in the swung-out position of the lever 125, Fig. 14.

After the typewriting-calculating machine has been prepared for multiplication in the hitherto described manner, the multiplicand which for example, may begin with the figure "5" is now introduced. For this purpose the calculating key 10 which corresponds to the figure "5" is struck and the following operations performed:

Mechanism for introducing the values

A downwards pointing arm 200 Figs. 3 and 18, has been provided at the key lever 26, of the respective calculating key 10 corresponding to the figure "5." A bar 202 is jointed to the arm 200 by a screw 201. The rearward pointing end of the bar 202 is guided in a longitudinal slot 204, Fig. 3, of a guide fork 205. A tension spring 207 is fastened at one end in a bore hole 206 of the bar 202 and with the other end in a suspension member 208 attached to the guide fork 205. The bar 202 by the action of the spring 207 constantly tends to move clockwise around the screw 201 until its upper edge strikes against the upper end of the longitudinal slot 204.

A curved slot 209 has also been provided in the rearward pointing end of the bar 202. An embossed rivet 210 of a slide 211 protrudes through this slot 209. The slide 211 is mounted to slide vertically in the guide slots 212 and 213 of a U-shaped guide member 214. This guide member 214 to which also the guide fork 205 is bolted is fastened by screws to the cross member 215 of the frame work 12.

These members 200, 201, 202, 204, 207, 203, 209, 210, 212, 211 and 213 are likewise connected with the remaining calculating keys 10 of the figures from "0" to "9."

The customary lugs 218 which are connected with the automatic total taking mechanism have been arranged in semi-circular shape on the known shaft 217, Figs. 3 and 11, opposite the upward pointing lugs 216 of the slides 211. The arrangement of the total-taking mechanism has already been described in detail in the Patent application Ser. Nr. 146,897 so that its operation shall be described in the following only as far as it is necessary for the introduction of the multiplicand- and multiplicator values.

Introduction of values

When the calculating key 10 which is connected with the figure "5" is depressed, its key lever 26 and the catch lever 27 are moved clockwise around the supporting shaft 28, Fig. 4, simultaneously the arm 200 tends to move the bar 202 corresponding to the figure "5" in direction of the arrow. The incline 209*a* of the curved slot 209 of the bar 202 now tends to move the rivet 210 of the corresponding slide 211 in the direction of arrow 220. Thereby the lug 216 of the slide 211 of the figure "5" is moved into the path way of the lug 218*a* of the shaft 217 corresponding to the figure "5" and in this manner the introduction of the multiplicand value "5" is completed.

During the introduction of the value "5," the known total-taking mechanism which has been described in the above mentioned patent is forcibly connected with the driving mechanism of the machine. For this purpose the following mechanism has been designed.

Mechanism for the introduction of the value formation

A lug 221 has been mounted on the cam 31, Fig. 18, of the control clutch 29, 30, 31, referring to the figure "5", as well as on the cam 31 of the control clutches 29, 30, 31, referring to the remaining figures "0" to "9". This lug 221 cooperates with the opposite roller 222 of the shaft 195 on which similar rollers 222 are mounted opposite the other cams 31. The shaft 195 is able to control by its lug 194 the known members 193, 180, 183, 186 and 188.

The lever 188, Figs. 14 and 18, cooperates with a pin 223, Fig. 18, which is fastened to a catch lever 224 mounted to swing around the supporting shaft 28. A tension spring 225 is fastened to the pin 223 of the catch lever 224 and with its other end the spring 225 is fastened to a bolt 226 which is held in a customary U-shaped clamp 227 of the frame work 12. The catch lever 224 by the action of the spring 225 constantly tends to move anti-clockwise around the shaft 28, whilst in

rest position a bevelled lug 228 strikes against a downwards pointing arm 229 of a the key lever 230 of the total-taking key 11. A rearward pointing arm 231 of the catch lever 224 cooperates with the lug 232 of the clutch pawl 233 of the known control clutch 233, 234, 235 connected with the total taking key 11 and normally keeps the clutch pawl 233 from engaging the coupling gear 237 mounted on the driving shaft 33 against the action of the pressure spring 236.

Introduction of value formation

When depressing the calculating key 10 of the figure "5", the control clutch 29, 30, 31, Fig. 4, which in known manner is also connected with the calculating key, is connected for a complete revolution with the driving shaft 33 in the direction of arrow 32. At the beginning of this turning movement the lug 221 of the cam 31 engages the roller 222 of the shaft 195, whereby the swing frame 197, Fig. 3, is swung clockwise around its supporting shaft 196. It should be noticed, however, that the movement of the swing frame 197 in this case only covers a partial way of the swing movement required for the support of a shifting step of the paper carriage of the typewriting-calculating machine.

During the swing movement of the swing frame 197 its shaft 195 slides downward into the guide slot 198 of the supporting member 185. Simultaneously the lug 194, Fig. 14 and 16, of the shaft 195 engages the lug 193 of the slide 180 moving the same and, owing to the screw slot connection 181, 182, also the part 183 and the shaft-end 186 anti-clockwise, Fig. 16, against the spring 190. The lever 188 also participates in the swing movement of the shaft-end 186 and engages the pin 223 of the catch lever 224 thereby swinging out the pin 223 clockwise around the supporting shaft 28 against the tension spring 225. Consequently the arm 231 of the catch lever 224 is disengaged from the lug 232 of the clutch pawl 233, so that the latter by the action of the pressure spring 236 tends to move towards the clutch wheel 237 and engages same. As a consequence, the cams 234, 235 are connected with the drive shaft 33 turning in direction of arrow 32.

Accordingly, the control clutch 29, 30, 31 of the figure "5" as well as the control clutch 233, 234, 235 of the total-taking device participate simultaneously in the turning of the drive shaft 33 and the control clutch 233, 234, 235 takes up connection with the drive shaft 33, after the control clutch 29, 30, 31 has completed a turn of about 15°. Turning of the control clutch 29, 30, 31 does not influence the counting slide 35, Fig. 3 of the figure "5" in any way since the slide 35 is kept in rest position by the locking device 163, 164 owing to the previous depression of the preparatory key 14, as explained under the heading "Operation of the preparatory mechanism for the multiplication". It is further explained that owing to non-operation of the total-taking key 11, the zero key, not shown in the diagrams but designated in Patent application Ser. No. 146,897 with 154, which is brought into operative position by the total-taking key 11, can therefore not be operated.

As soon as the lug 221 of the cam 31 releases the roller 222 during the turning of the control clutch 29, 30, 31 of the figure "5", the swing frame 197 and also the members 180, 183, 186, 188 and 224 will return into rest position, Fig. 14, by the action of the spring.

Formation of values

The value "5" of the multiplicand is formed by the known total-taking mechanism owing to the control clutch 233, 234, 235 (Fig. 16 and 19) of the total-taking mechanism of the typewriting-calculating machine with the drive shaft 33, as follows:

The total-taking mechanism for the automatic decimal blank printing of the column totalizers of the typewriting-calculating machine has already been thoroughly explained in the Patent application Ser. Nr. 146,897. For quicker understanding however the operation of this mechanism shall be shortly described as far as it concern the forming of the multiplicand value "5". It is pointed out here that when depressing the preparatory key 14, a clutch mechanism, not shown, which can be controlled in dependence of the turning of the control clutch 233, 234, 235, is released in a suitable manner. Consequently, when the control clutch 233, 234, 235 is beginning to turn by way of this clutch arrangement, a clutch 239, 240, is operated which is located between the shaft 217, Fig. 23, of the total taking mechanism and the shaft 238 mounted to revolve in the frame 96 of the multiplying mechanism.

A small catch-wheel 241 is mounted on the shaft 238 for sliding but not for rotation. This catch wheel 241 by way of a system of coupling rods and in dependence of the paper carriage movement can be set into the respective decimal place of the multiplicand mechanism 242 receiving the multiplicand, as illustrated in diagrammatic view 23, into which the multiplicand value "5" shall be introduced. The catch-wheel 241 can of course also be set into the various decimal places of the multiplicator value 243 of the multiplying mechanism receiving the multiplicator. This done by way of the system of coupling rods mentioned above in dependence of the paper carriage movement. The raised part of the cam 234 of the control clutch 233, 234, 235 releases the unlocking mechanism 244 when the control clutch 29, 30, 31 connected with the figure "5" as well as the control clutch 233, 234, 235 (Figs. 18, 19 to 21) connected with the totaltaking mechanism 11 are turned in the direction of arrow 32 and the unlocking mechanism 244 will slide downwards on the decline of the cam 234 under the influence of its springs 245. The oblique face 246 of the unlocking mechanism 244 during its downward movement cooperates with the member 248 which is arranged to get out of the pathway towards above inside of the member 247, Figs. 19, 19*a*, 20 and 21, which is mounted to swing loosely on shaft 24 and thereby moves the member 247 in direction of arrow 40. The lug 249 of the member 247 causes the lever 250 to swing in the direction of arrow 251. Simultaneously the shaft 252 and the lever 253, 254 and 255 participate in this movement causing the gear 258 to be moved towards the right by way of the driving connection 256, 257, Figs. 19 and 21, so that the gear 258 will mesh with the teeth 259 of the zero setting slide 260. The catch pawl 261 with its lug 262 now catches behind the lever 253 with the members 250, 252, 253, 254, and 255 in the above described position and consequently locks the lever 253 as well as the members 252, 250, 253, 254 and 255 in operative position.

The member 247 during its swing movement in the direction of arrow 40 also engages the square lug 263, Figs. 19, 19*a*, of the lever 264, which is rigidly mounted on the shaft 24. In this way the lever 264, the shaft 24 and the releasing finger 39,

which is mounted on the shaft **24** and unlocks the operative calculating position of a column totalizer, are also moved in the direction of arrow **40**, as is also the lever **24***a* which locks the driving mechanism **41**, Fig. 19. Consequently, that denomination of the column totalizer **7** tabulated into operative position, which is to accumulate the multiplicand value "5", is released for receiving the value and the device which normally locks the calculating mechanism **24***a*, **41**, is unlocked.

The members **247**, **264**, **24**, **24***a*, **39** are kept in operative position by the edge **246***a* during the continued decline of the unlocking mechanism **244**. Simultaneously the lug **265** of the unlocking mechanism **244** engages the pawl **266** (Figs. 19, 10 and 21) and together with the catch pawl **267** tends to move it clockwise around the pivot **288** against the tension of spring **268**. The catch pawl **267** is now disengaged from the ratchet **270** of the angle **271** mounted on the zero setting slide **260** so that the latter is released for a downward move and the gears **272**, **273**, **274** are released for clockwise movement. Consequently, the two-part slide **275** engaging the gear **274** can respond to the action of its spring **276** and be moved in the direction of arrow **277**.

The teeth **278** of the slide **275** mesh with the gear **279** mounted on shaft **217**, turning the shaft itself clockwise as well as the shaft **238** and the catch wheel **241** through clutch **239**, **240**, Fig. 23, until this movement is checked by the lug **218***a*, Fig. 4 of the shaft **217**, which corresponds to the figure "5", striking against the lug **216** of the raised slide **211** of the figure "5". The turning movement of the members **217**, **239**, **240**, **238** and **241** as well as that of the slide **275** would therefore in the present case amount to 5 units.

Owing to the turning of the members **217**, **139**, Fig. 23, **240**, **238** and **241** by "5" units, the catch-wheel **241** will turn the opposite wheel of the multiplicand value **241** of the multiplying mechanism also by "5" units. In this manner the introduction of the multiplicand value "5" into the multiplying mechanism of the type-writing-calculating machine has been accomplished.

Introduction of the multiplicator is done in the same manner with the exception that the catch roller **241** is controlled by the paper carriage movement so that it will be placed opposite a gear of the multiplicator mechanism **243**.

When the slide **275**, Fig. 19, is moved in the direction of arrow **277** it turns the gears **274**, **273**, **272** clockwise so that the gear **272** will move the zero setting slide **260** downwards by five units. The teeth **259** of the zero setting slide **260** thereby turn the gear **258** and through the clutch **280**, **281** also turn clockwise the shaft **46**, Fig. 19. Simultaneously the shaft **51** and the driving gear **41** are also turned clockwise by "five" units through the gears **47**, **48**, **49**, **50** and the driving gear **41** also transfers the "5" into the operative calculating place of the column-totalizer **7** accumulating the multiplicand.

The lug **265** of the unlocking slide **244** during its declining movement releases the pawl **266** and causes the same together with the catch pawl **267** to return into their initial position. Simultaneously the catch pawl **267** engages with the locking tooth **270** which has come to face it at the end of the decline of the zero setting slide **260** and in this way secures the set position of the members **260**, **272** to **275**, **217**, **239** (Fig. 23), **240**, **238** and **241**.

Shortly thereafter the edge **246***a* of the unlocking slide **244** during its downward movement again releases the member **248** so that the members **247**, **263**, **24**, **24***a* and **39** again swing back into rest position and, owing to the lock **24***a*, **41** falling into place again, also secure the set position of the members **51**, **50**, **49**, **48**, **47**, **46** and **258**.

Printing of the multiplicand value

After the multiplicand value "5" has been formed in the above described manner and has been accumulated in the column-totalizer as well as introduced into the multiplicand feature **242** of the multiplication mechanism of the typewriting-calculating machine, the multiplicand value "5" is printed on the paper moved around the typing roller.

The mechanism of said printing device need not be explained here since a detailed description of same has been given in patent application Ser. No. 146,897 and the said printing mechanism shown in Figs. 2 and 22 differs only slightly from that referred to in the above mentioned patent. During the further turning of the control clutch **29**, **30**, **31** of the figure "5" as well as of the control clutch **233**, **234**, **235** of the total-taking mechanism (Figs. 19 to 22) in the direction of arrow **32** and during the consequent further decline of the unlocking slide **244**, the pin **290** now engages the arm **291** (Figs. 2 and 22) of the lever **292**, moving the latter clockwise around its pivot screw **293**. Simultaneously the lever **292** by its front edge **294** engages the curve **295** of the slide **296** moving the latter against the action of its spring **297** in the opposite direction of arrow **170** and causing the square lug **298** of the slide **296** to engage in the slot **299** of the lever **300**.

During the further turning of the control clutches **29**, **30**, **31** and **233**, **234**, **235** in the direction of arrow **32**, the raised part **301** (Fig. 19) of the cam **235** of the control clutch **233**, **234**, **235** engages the arm **302** of the lever **303** moving it clockwise around the pivot screw **305** against the action of its spring **304**.

The lever **300** participates in this movement so that, owing to the previously established driving connection **298**, **299** and the slide **296**, also the swing frame **306** is moved clockwise around its pivot bolts **307** and **308**. During the swing movement the angle levers **310** of the figures "0 to 9" which are mounted to swing on the shaft **309** of the swing frame are lifted upwards (in Fig. 22 only the angle lever **310** connected with the figure "5" is shown).

As described under the heading "Formation of values", the lug **218***a* corresponding to the figure "5" of the shaft **217** was arrested during its clockwise movement in the setting position shown in Fig. 22 by the opposite raised slide **275** of the figure "5" and therefore the angle lever **310** corresponding to the figure "5" strikes the lug **218***a* by its arm **311** immediately at the beginning of the movement of the swing frame **306**. Consequently this angle lever **310** is moved anti-clockwise around the shaft **309** by the continued movement of the swing frame **306**, **309**, and simultaneously moves the draw bar **312** in the direction of arrow **170**. The draw bar **312** also moves the intermediary lever **57** clockwise around its pivot **57***a* and simultaneously the type lever **58** with the type "5" is made to print in known manner on the sheet in front of the printing roller of the paper carriage **5**. The carriage is shifted as usual as soon as the type lever **58** falls back into place and simultaneously the catch roller **241** (Fig. 23) is shifted one decimal place further towards the right on the shaft **238** through the

known system of connecting rods, so that it will mesh with the next wheel of the multiplicand mechanism 242.

The paper carriage shift is supported in its movement by a device according to Patent 2,141,158 since meanwhile the turning of the control clutches 29, 30, 31 (Fig. 18) and 233, 234, 235 in the direction of arrow 32 has progressed sufficiently so that the raised part of cam 31 (Fig. 4) of the control clutch 29, 30, 31 bears upon the roller 222 of the shaft 195 of the swing frame 197.

Consequently, the swing frame 197 is moved clockwise around the supporting shaft 196 and the paper carriage shift towards the left is accelerated, as described in the above mentioned patent.

It should be noticed that now the clutch 239, 240 (Fig. 23) located between the shaft 217 and the shaft 238 in dependence of the turning of the control clutch 233, 234, 235 is suitably reopened.

During the movement of the swing frame 197, its shaft 195 sliding downwards in the longitudinal slot 198 (14, 16 and 17) of the supporting member 185 once more with its lug 194 engages the lug 193 of the slide 180 and thereby cooperates with the members 180, 183, 186, 188, 224, as described under the heading "Introduction of value formation", without however, moving any other parts. When the shaft 195 moves still further downwards in the slot 198 of the supporting member 185 until it has reached the position shown in Fig. 17, which causes further anti-clockwise movement of the members 180, 183, 186 and 188 as well as clockwise movement of the locking lever 224, an abutted edge 313 of the slide 180 will run off the rounded front edge 314 of a square lug 315 of a guide member 317 which has been bolted to the supporting member 185 by screws 316. In this way the slide 180 and through the nose 179 lying up against the rear edge 178 of the slide 174, also the last named member is moved against the spring 176 against the direction of arrow 170. The lug 193 of the slide 180 gets out of the pathway of the lug 194 of the shaft 195 so that the members 180, 183, 186, 188 can swing back clockwise by the action of the spring 190 and the lever 224 can swing back anti-clockwise by the action of the spring 225 into the position shown in Fig. 17, in which the upper edge of the member 183 again lies close against the stop pin 192. As soon as the bevelled edge 313 of the slide 180 leaves the front edge 314 of the guide member 317, the slides 180 and 174 are again moved in the direction of arrow 170 by the spring 176 until the lug 193 of the slide 180 strikes against the front edge 194*a* of the lug 194 of the shaft 195.

Restoring the various devices in operation to their initial position

The lever 318 (Figs. 2 and 19) mounted on the left end of the shaft 195 is put into operation simultaneously with the downward movement of the shaft 195 of the swing frame 197 in the longitudinal slot 198 of the supporting member 185. Consequently the rocking device 319 is moved clockwise around its pivot screw 320 and with its bevelled edge 321 bears upon the lower edge 322 of the slide 323, moving the latter upwards against the spring 324. Simultaneously the catch pawl 261 is moved clockwise against the spring 327 owing to the driving connection 325, 326 and the obstructing lug releases the lever 253 again so that the latter as well as the members 250, 252, 254, 255 connected therewith can return into their initial position owing to the tension of the spring 253*a*.

The raised part 328 (Fig. 22) of the cam 235 of the control clutch 233, 234, 235 again releases the arm 302 of lever 303 during the present and subsequent turning of the control clutch 29, 30, 31 of the figure "5" as well as of the control clutch 233, 234, 235, whereupon the lever 303 and the members 300, 306, 309, 310 swing back into their initial position.

The raised part of the cam 234 of the control clutch 233, 234, 235 simultaneously bears upon the unlocking slide 244 and moves it upwards again, allowing the teeth 270 of the ratchet (Fig. 21) of the zero setting slide 260 to pass by the catch pawl 267. In consequence of this upward movement of the unlocking slide 244, its pin 290 again releases the arm 291 (Fig. 22) of the lever 292, allowing the latter together with the slide 295 to be restored to their position of rest by the action of the spring 297.

The unlocking slide 244 during its upward movement also returns the zero setting slide 260 into zero position through the members 329 (Fig. 19), 330, 331 and also the gears 272, 273, 274, 275 as well as the shaft 217 against the spring 276. It may be noticed that the shaft 238 (Fig. 23) of the multiplying mechanism is not altered in any way since, as mentioned before, the clutch 239, 240 was opened between the two shafts 217 and 238. Meanwhile also the raised part 328 (Fig. 19) of the cam 235 of the control clutch 233, 234, 235 has been moved within reach of the opposite roller 332 of the shaft 195 of the swing frame 197 which at this point is still held in swung-out position by the raised part 31*a* (Fig. 18) of the cam 31 of the control clutch 29, 30, 31 of the figure "5." With the continued turning of the two control clutches 29, 30, 31 and 233, 234, 235 at first the raised part 319 of the cam 31 releases the roller 222 of the shaft 195 of the swing frame 197 and shortly thereafter also the raised part 328 of the cam 235 releases the roller 332 of the shaft 195 of the swing frame 197, whereupon the latter returns into its position of rest. Simultaneously its shaft 195 (Fig. 17) slides upwards in the longitudinal slot 198 of the supporting member 185 from the position shown in Fig. 17 into the position shown in Fig. 14, so that the front edge 194*a* of the lug 194 of the shaft 195 again releases the lug 193 of the slide 180 allowing the slides 180 and 174 to return completely into their position as shown in Fig. 14 by the action of spring 176.

Following the upward movement of the shaft 195 of the swing frame 197 in the longitudinal slot 198 of the supporting member 185, the members 318 (Fig. 19) 319, 323 and 261 are also moved into their position of rest by the action of springs 324 and 327. Meanwhile the control clutch 29, 30, 31 of the figure "5" has completed a full turn so that it is separated from the driving shaft 33 in known manner and the levers 28, 27 of the figure "5" return from the depressed position as shown in Fig. 4 into the position of rest as shown in Fig. 3. Simultaneously the members 202 and 211 of the figure "5" are returned into their normal position.

Shortly thereafter the control clutch 233, 234, 235 also completes a full turn during which the clutch pawl 233, Fig. 18, is brought out of reach of the clutch gear 237 by the lug 232 striking against the arm 231 of the catch lever 224 against the action of the pressure spring 236, so that

also this control clutch **233**, **234**, **235** is brought to a standstill.

Now the remaining values of the multiplicand are introduced by depressing the respective calculating key **10**. The above described operations are repeated in this transaction during which, as will be understood, the respective means (Fig. 19) must be moved through a distance corresponding to the introduced value. When striking the calculating key **10** corresponding to zero, however, these value forming means remain in their position of rest.

The following should be noted: If in that moment in which the depressed calculating key **26** corresponding to the figure "5" is returned into rest position (Fig. 3) the calculating key of another figure is also depressed, say for instance, the calculating key **10** corresponding to the figure "1," the slide **211** corresponding to the figure "1" is raised in the direction of arrow **220** by the member **202** (Fig. 18) before the shaft **217** with the lugs **218** during its return movement anti-clockwise has reached its position of rest, which means that the total-taking clutch **233**, **234**, **235** has been arrested. During this anti-clockwise turn of the shaft **217**, the lug **218** corresponding to the figure 1 in this case bears upon the decline **211***a* of the raised slide **211** of the figure "1" causing it to escape downwards in the opposite direction of arrow **220**.

Owing to the driving connection **210**, **209**, the bar **202** tends to move somewhat anti-clockwise around the screw **201** against the action of the spring **207** so that the bar **202** slides downwards in its slot **204** of the ledge **205**. As the shaft **217** continues to be turned back anti-clockwise, the lug corresponding to the figure "1" releases the slide **211**, whereupon the members **211** and **202** return instantly into their set position by the action of spring **207**, as shown in Fig. 4. It be further mentioned, that when the single calculating keys **10** are struck in rapid succession, the total-taking clutch **233**, **234**, **235** (Fig. 18) is not first separated from the driving shaft **33** for the reason that the pawl **224** which arrests the total-taking clutch **233**, **234**, **235** in dependence of the respective control clutch **29**, **30**, **31** connected with the driving shaft **33**, when depressing a calculating key **10** already is moved by the members **221**, **222**, **195**, **194**, **193**, **180**, **183**, **186**, **188** into the position shown in Fig. 16, as soon as the total-taking clutch **233**, **234**, **235** has completed a full turn. For this reason the clutch pawl **233** of the clutch **234**, **235** keeps in mesh with the clutch gear **237** so that the clutch **233**, **234**, **235** remains connected for another full turn.

Now the corresponding tabulation key **13**, Fig. 1, is depressed for introducing the multiplicator, which causes the paper carriage **5** as well as the catch wheel **241** (Fig. 23) to be set into the chosen decimal place of the column totalizer accumulating the multiplicator and also of the multiplying mechanism. Then the respective calculating keys **10** of the multiplicator value are depressed so as to introduce the multiplicator into the multiplicator device **243** of the multiplying mechanism as well as into the respective column totalizer, as described above. Now the key **15** (Fig. 1) is depressed to form the end-product, whilst the locking mechanism **139**, **141** is released again in a suitable manner through the lug **135***a* (Fig. 14) of the catch pawl **135** of the lever **125**. In this way the members **125**, **145** (Fig. 12), **147** **151**, **157**, **161**, **162** and **174** (Fig. 10) **130**, as well as **123**, **117** are returned to their position of rest (see Figs. 5, 10 and 13).

When the end-product key **15** is depressed the end-product is calculated by the multiplying mechanism of the type-writing-calculating machine and subsequently by total taking same is printed automatically on the paper kept in motion by the paper roller. At the end of the product total-taking the catch lever **107** (Fig. 10) is moved forcibly in the opposite direction of arrow **111** against the action of spring **110**. Thereby the lug **106** of the catch lever **107** again releases the lug **105** of the slide **100**, whereupon the slide **100** and the members **89**, **86**, **83**, **81** and **75** are returned to their normal position, as shown in Figs. 5, 7, 9 and 10, by the action of spring **78**, whilst owing to the lug **113** of the slide **100** bearing upon the edge **114***a* of the pawl **115**, the latter tends to move out of the way against its spring **118**. The machine is then ready again for normal figuring, that is, for additive and subtractive figuring as well as for total-taking from the column totalizers.

ROBERT ANSCHÜTZ.
ERNST HUGO KÄMMEL.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

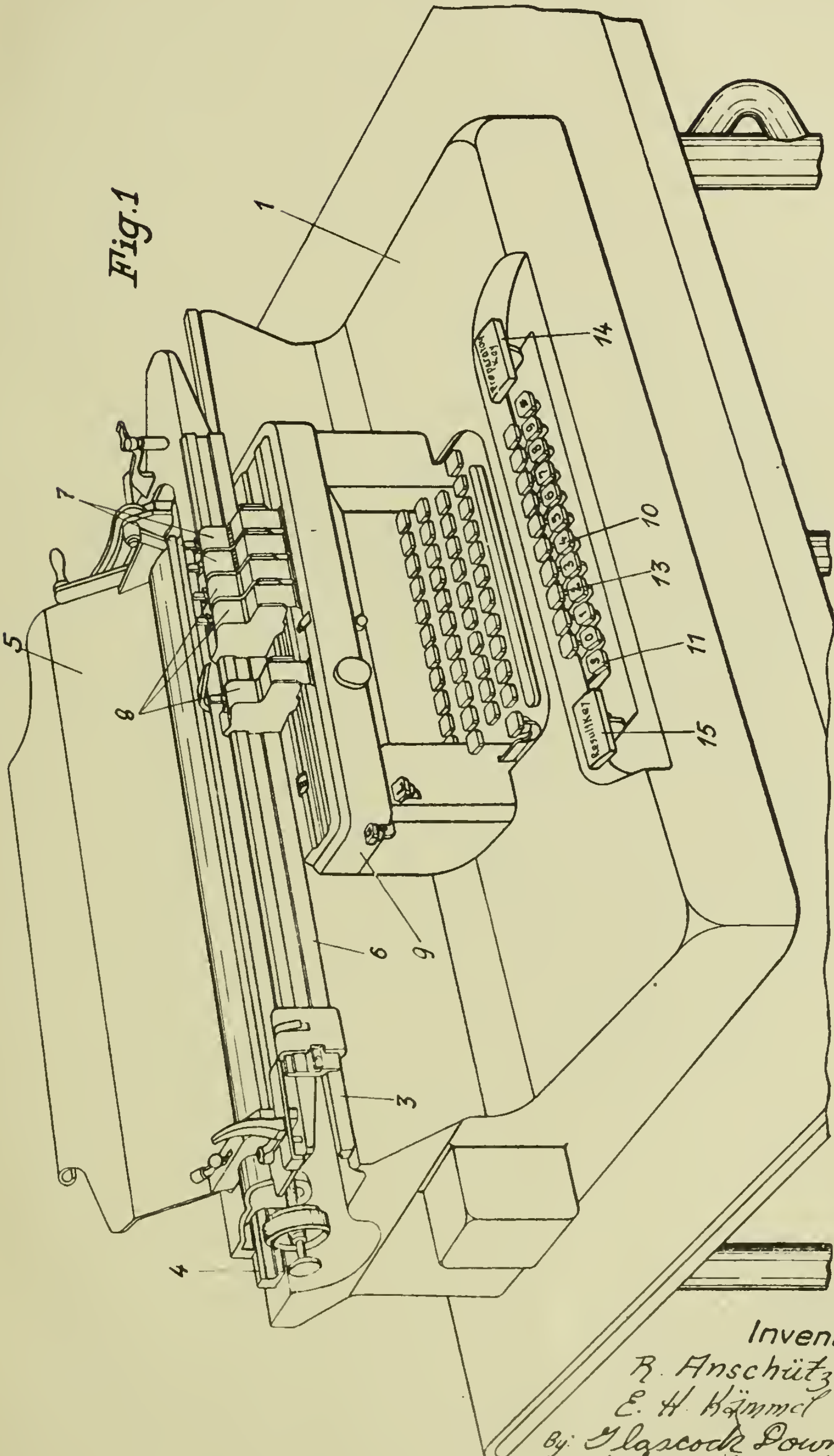
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 1

Fig.1



Inventors,
R. Anschütz &
E. H. Kämmel
By: Glascock Downing & Seebold Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

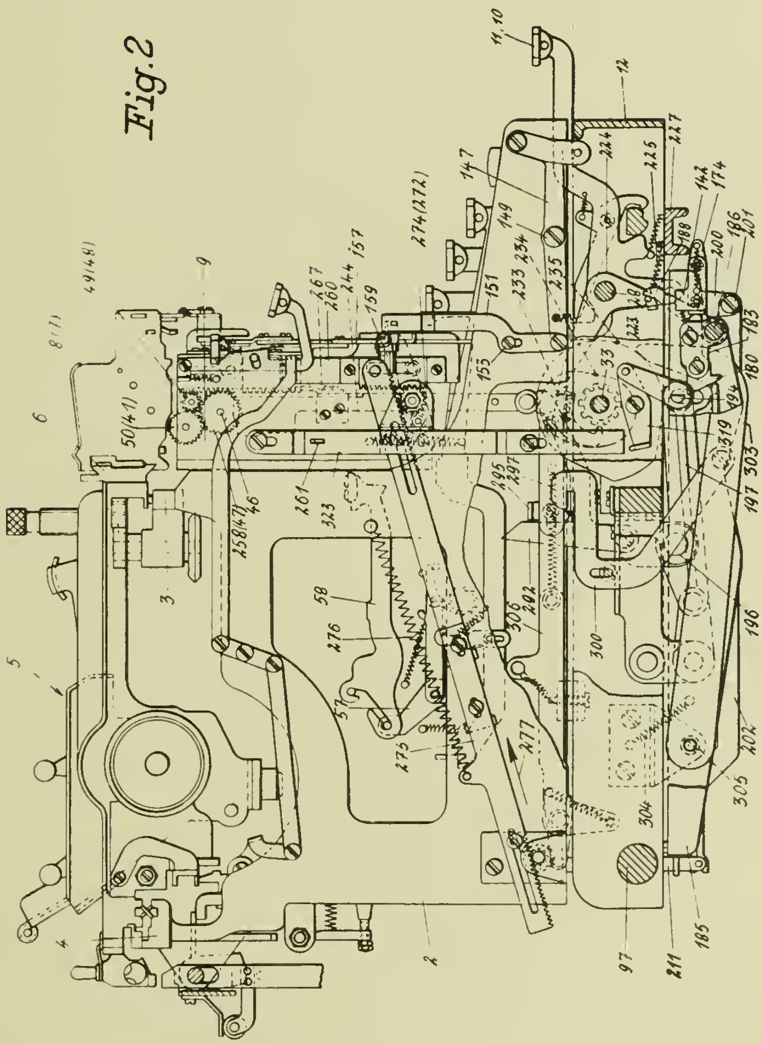
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 2

Fig. 2



Inventors,
R. Anschütz &
E. H. Kämmel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

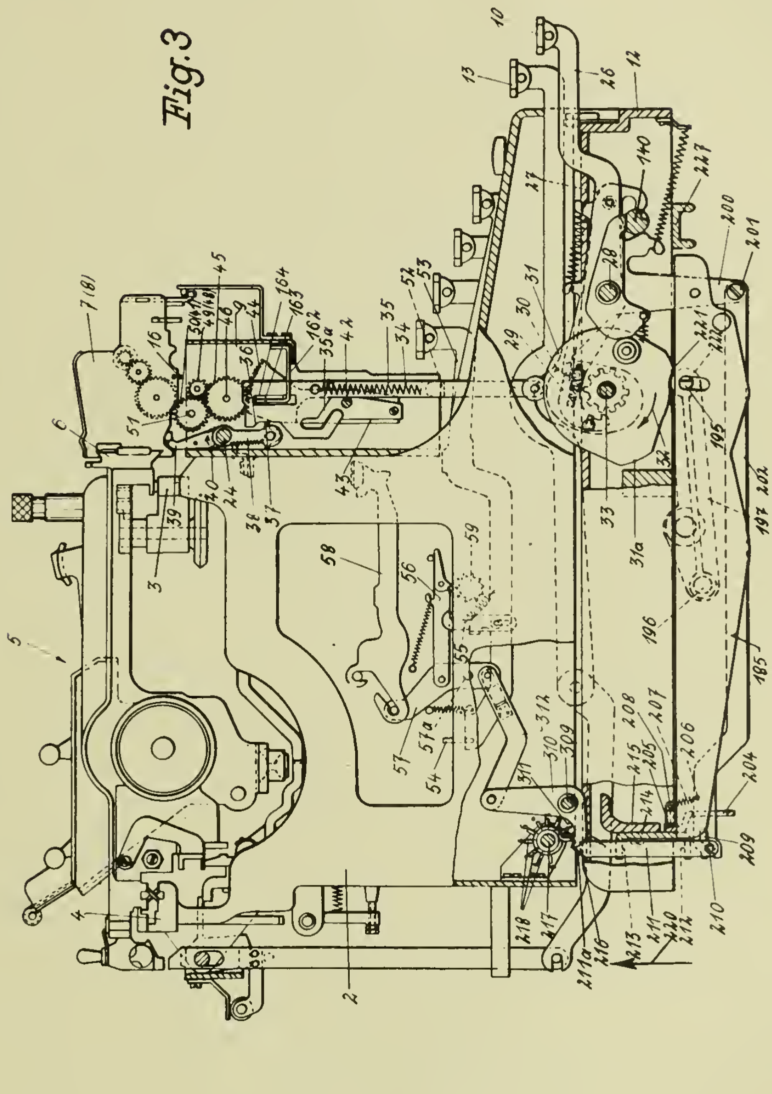
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 3

Fig.3



Inventors,

R. Anschütz &

E. H. Kämmel

By: Glascock Downing & Seebold

Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

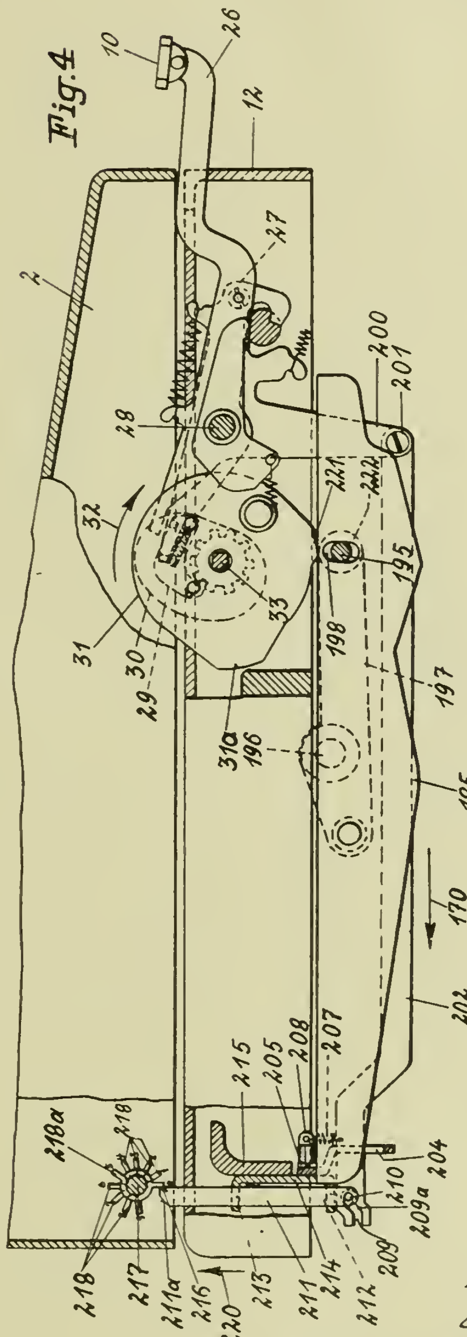
Filed May 31, 1940

Serial No.

338,272

22 Sheets–Sheet 4

Fig. 4



Inventors,

R. Anschütz +
E. H. Kämmel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 5

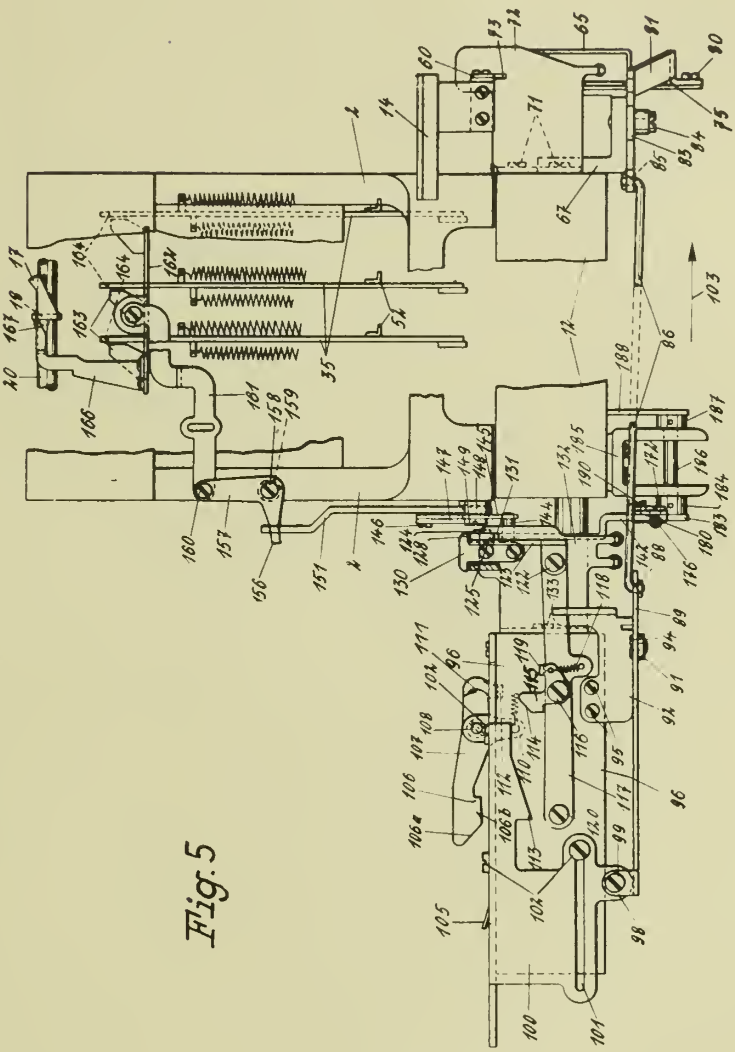


Fig. 5

Inventors,
R. Anschütz &
E. H. Kämmel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 6

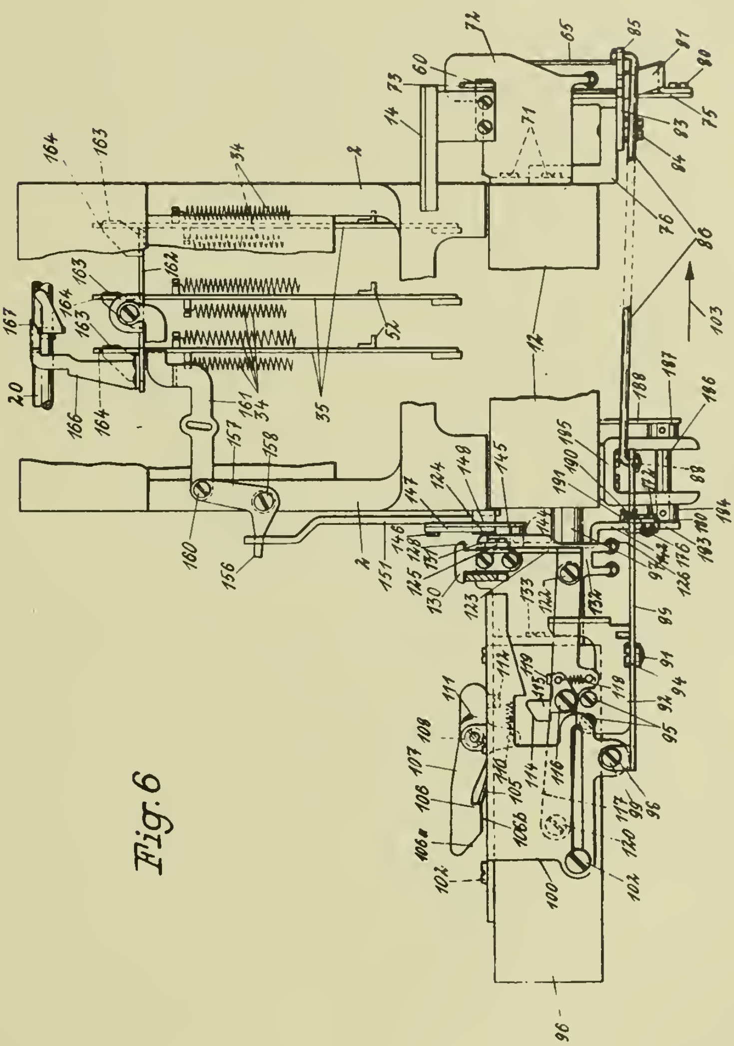


Fig. 6

Inventors,
R. Anschütz &
E. H. Kümmel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM

Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 7

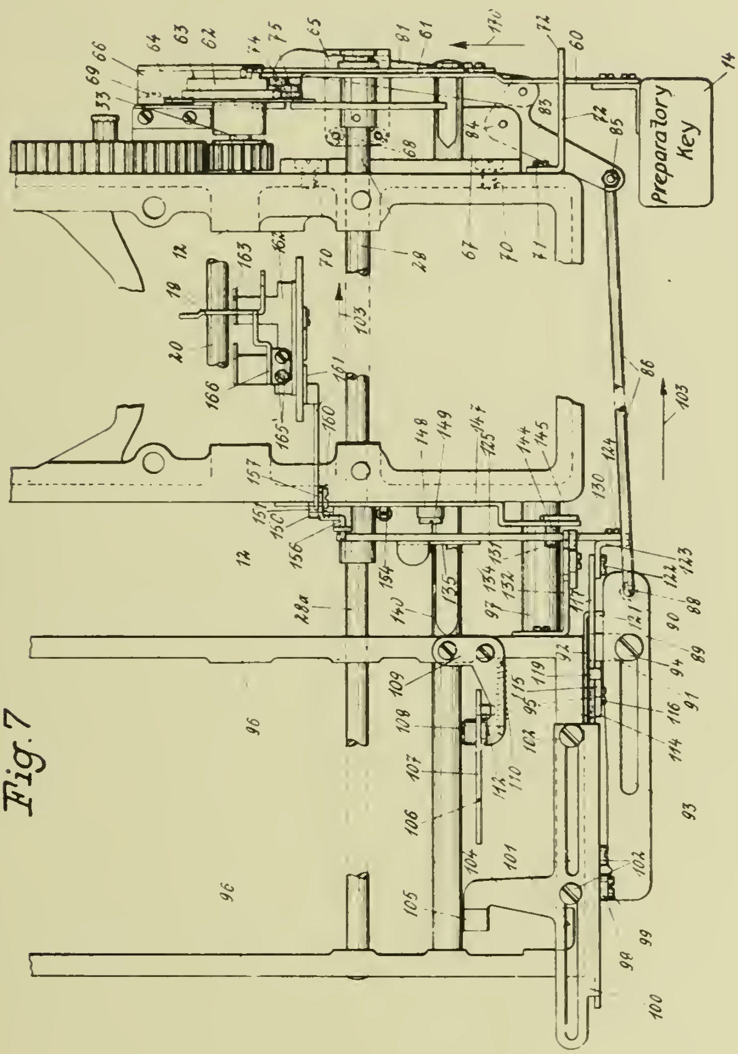


Fig. 7

Inventors,
R. Anschütz &
E. H. Kammel
By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM

Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 8

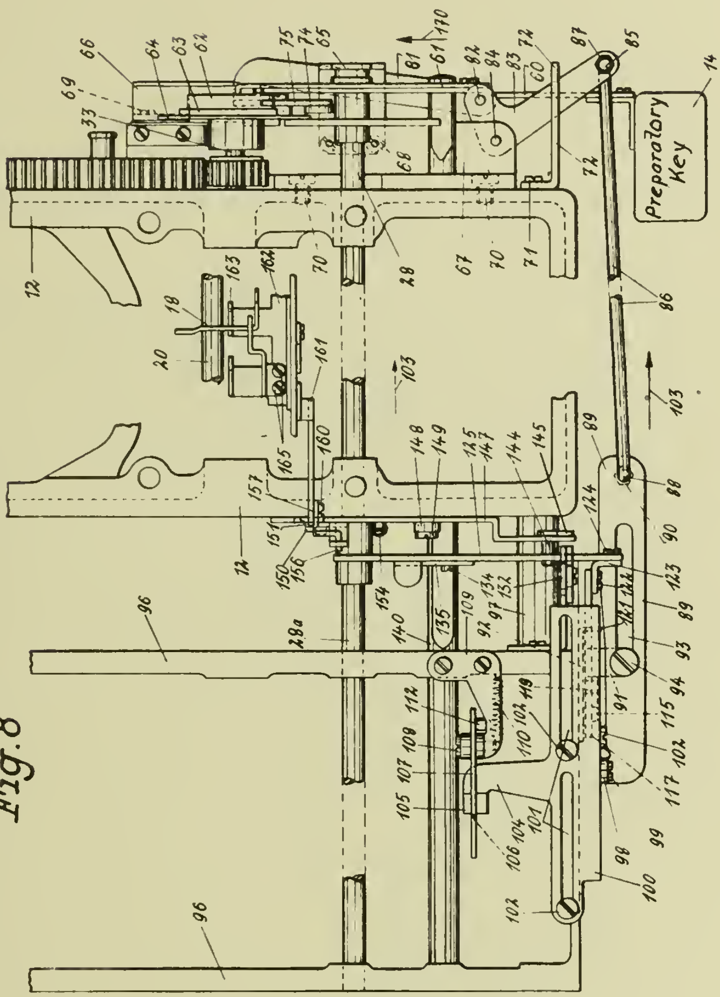


Fig. 8

Inventors,
R. Anschutz &
E. H. Kammel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 9

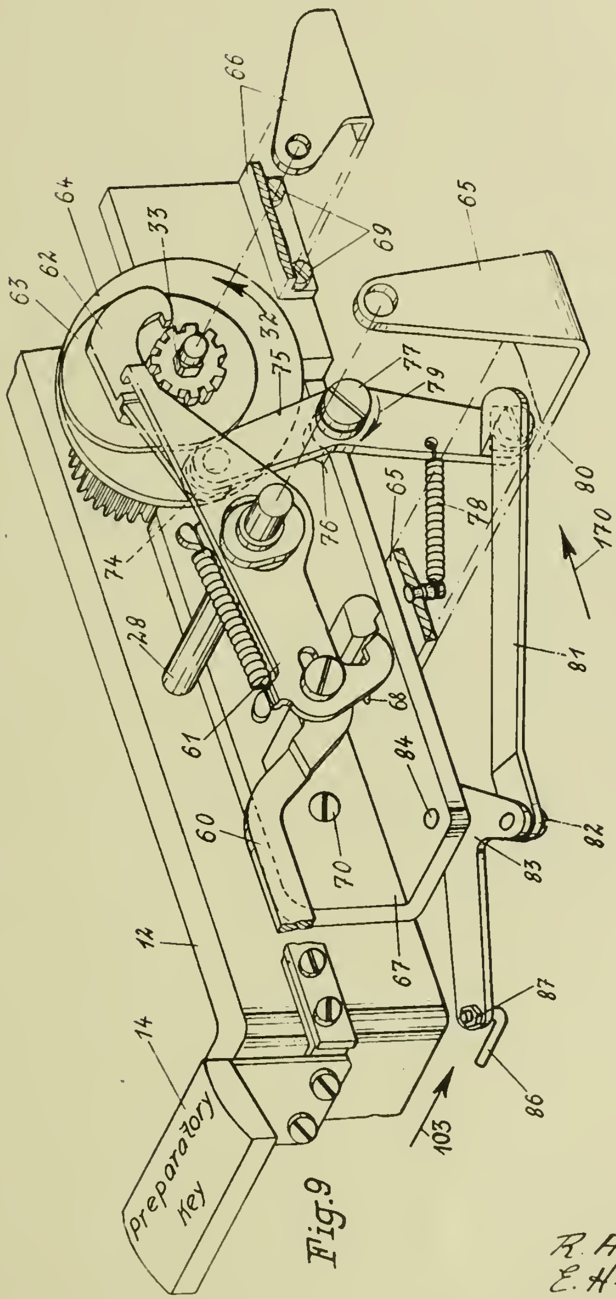


Fig.9

Inventors,
R. Anschutz, &
E. H. Kammel

By: Glascock Downing & Seebold
Attys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 10

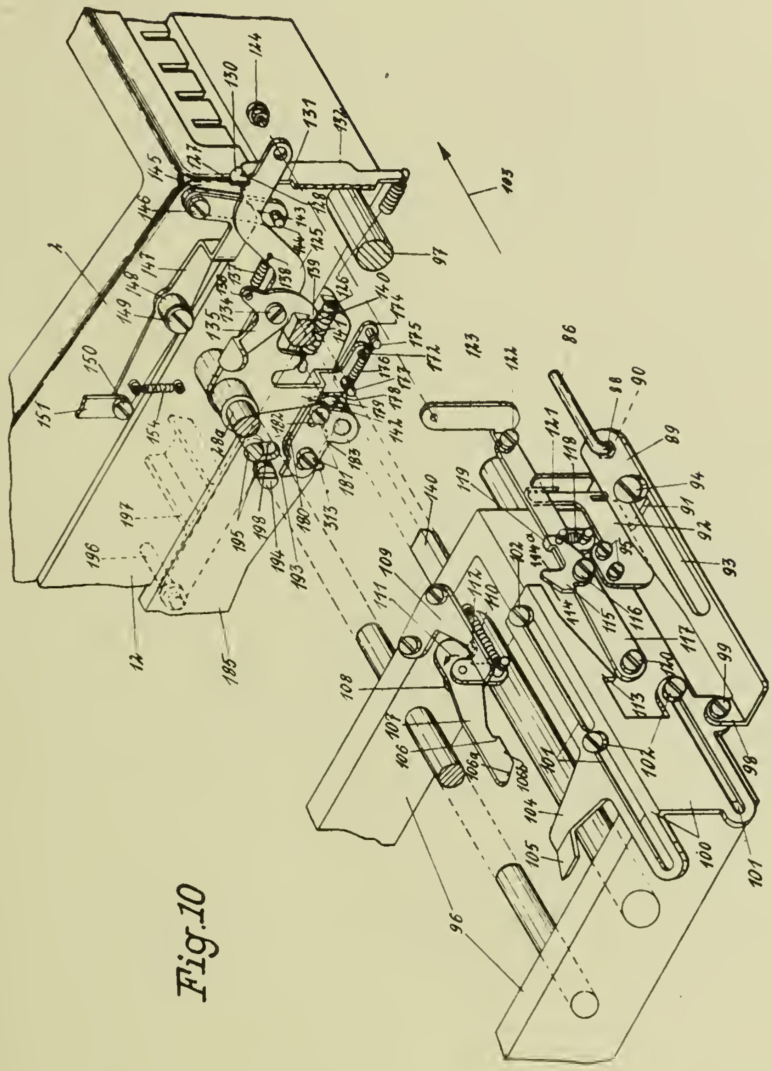


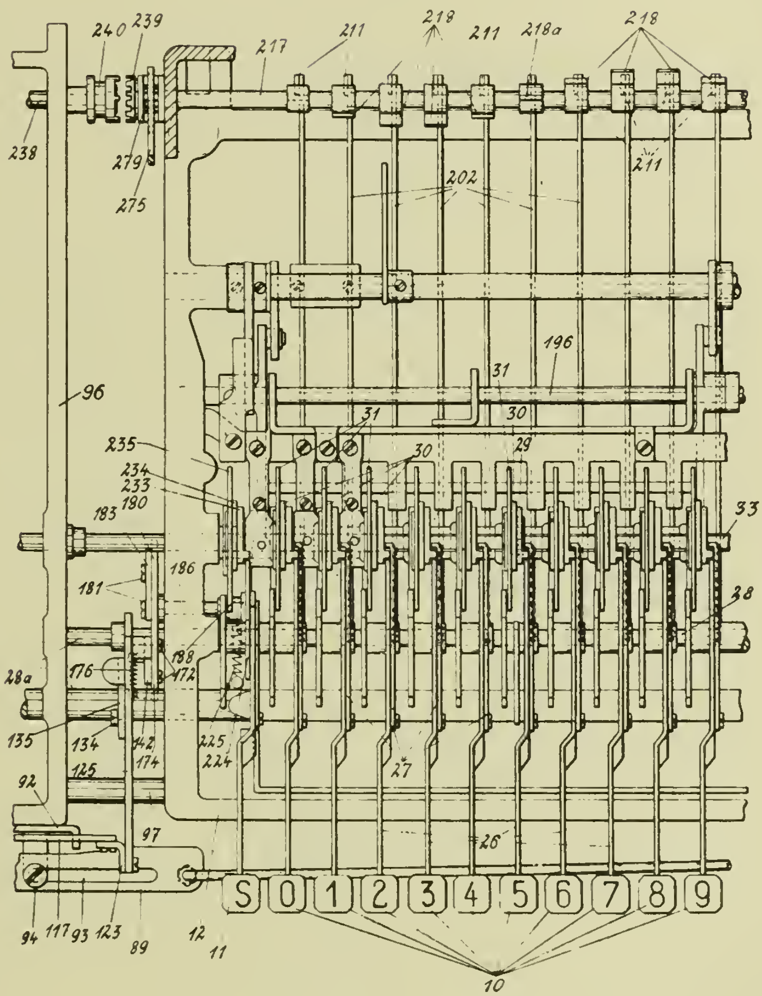
Fig.10

Inventors,
R. Anschutz &
E. H. Kammd

By: Glascock Downing & Seebold
Attys.

PUBLISHED	**R. ANSCHÜTZ ET AL**	**Serial No.**
MAY 25, 1943.	BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM	**338,272**
BY A. P. C.	Filed May 31, 1940	22 Sheets-Sheet 11

Fig. 11



Inventors,
R. Anschutz &
E. H. Kammel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

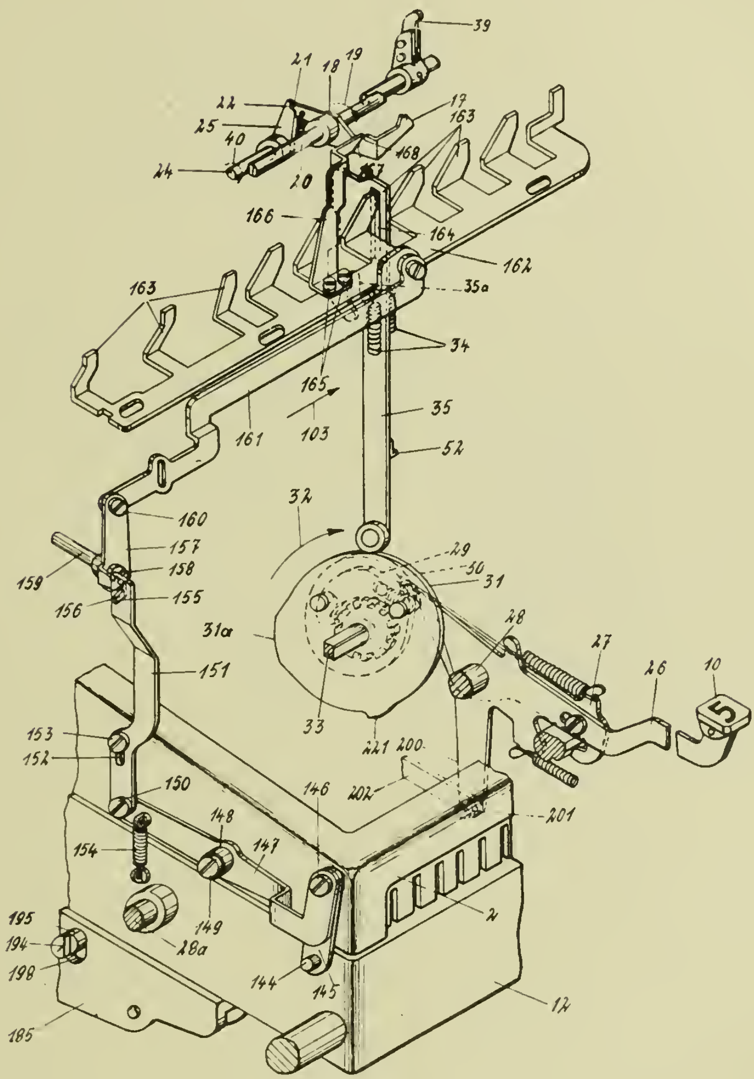
R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 12

Fig.12



Inventors,
R. Anschütz
E. H. Kammel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

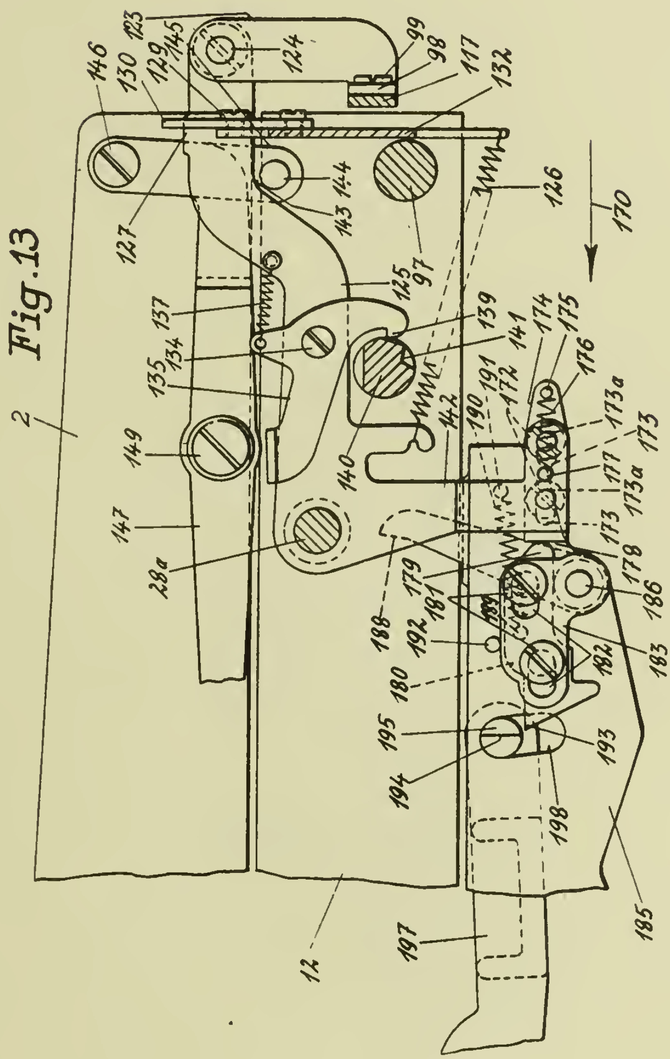
BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 13



Inventors,
R. Anschütz &
E. H. Kammel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

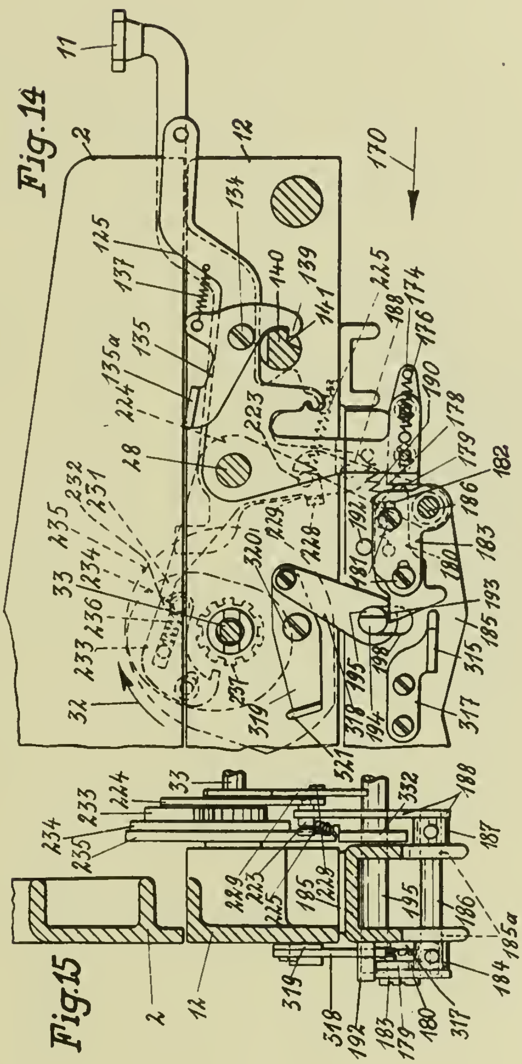
BY A. P. C.

R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 14



Inventors,
R. Anschutz &
E. H. Kammel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 15

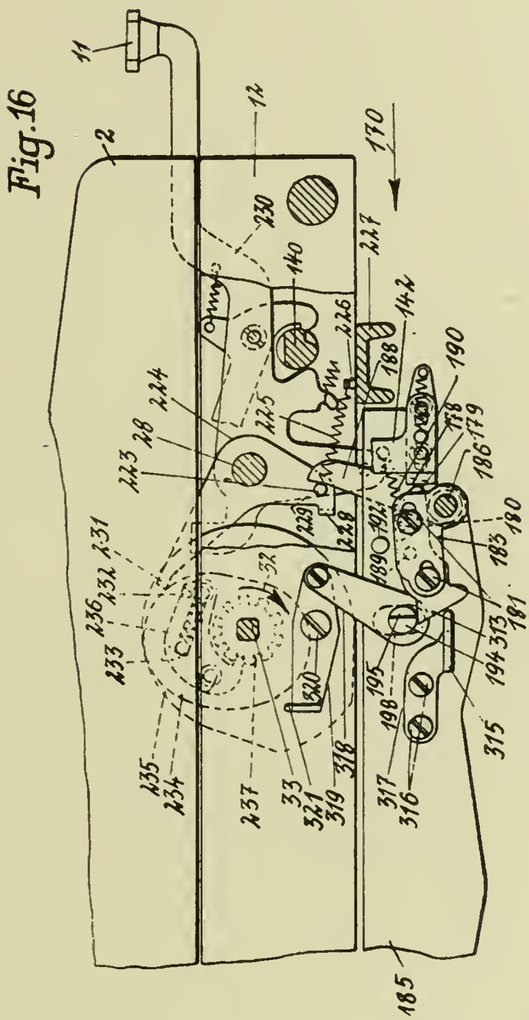


Fig. 16

Inventors,
R. Anschütz &
E. H. Kummel
By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

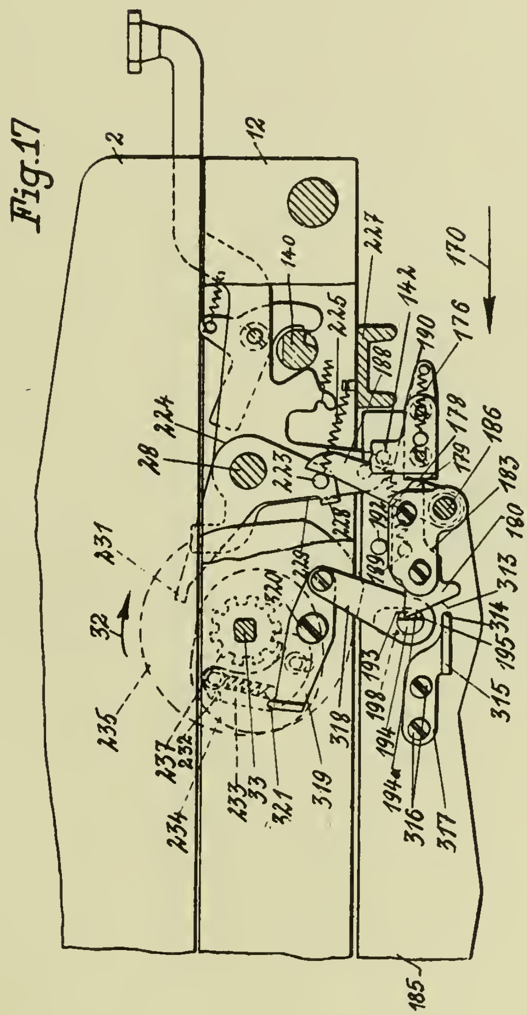
BY A. P. C.

R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 16



Inventors,
R. Anschütz &
E. H. Kammel

by: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 17

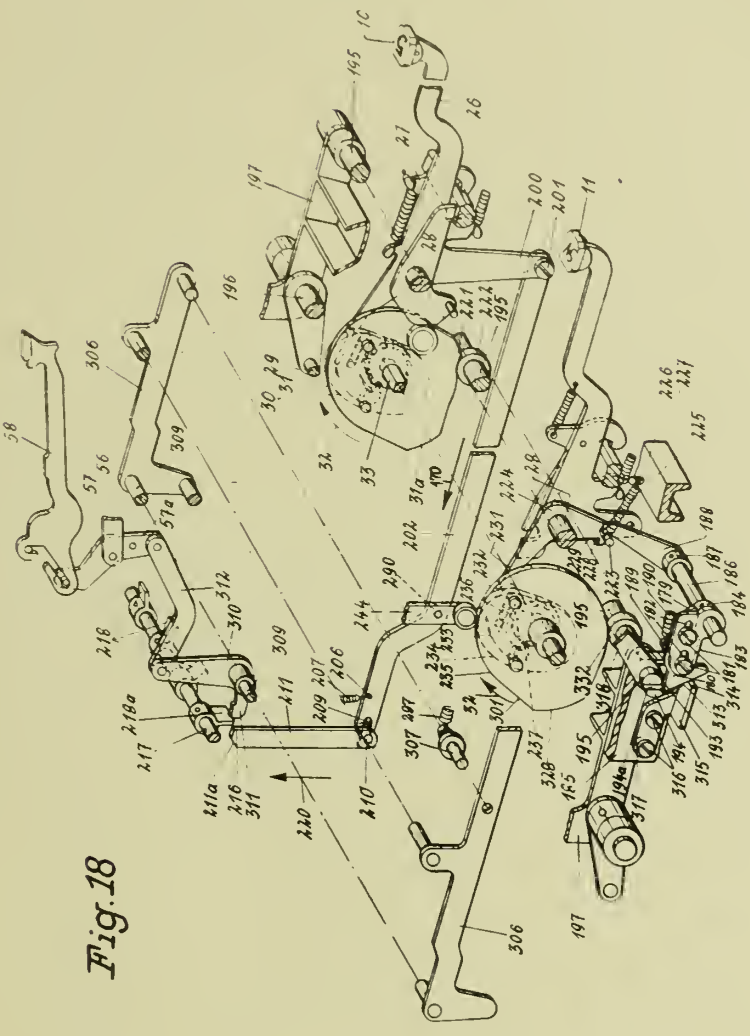


Fig. 18

Inventors,
R. Anschütz &
E. H. Kammel

By Glascock Downing & Seebold
Attys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 18

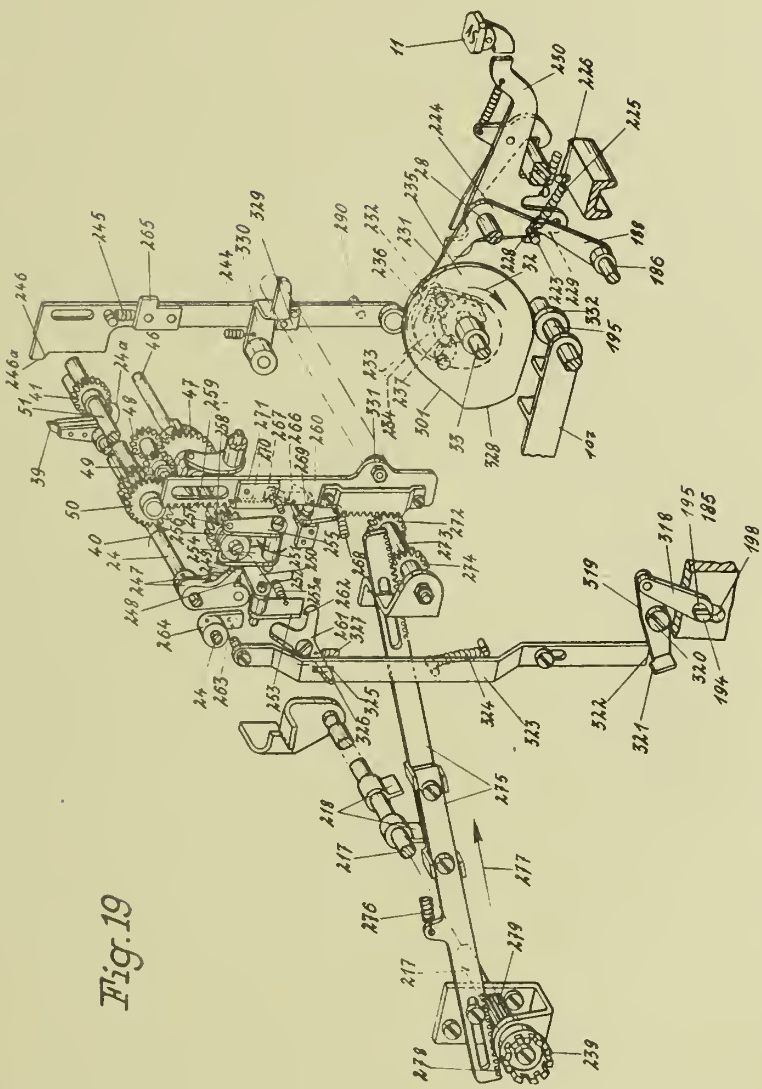


Fig.19

Inventors,
R. Anschütz &
E. H. Kammel

by: Glascock Downing & Seebold Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 19

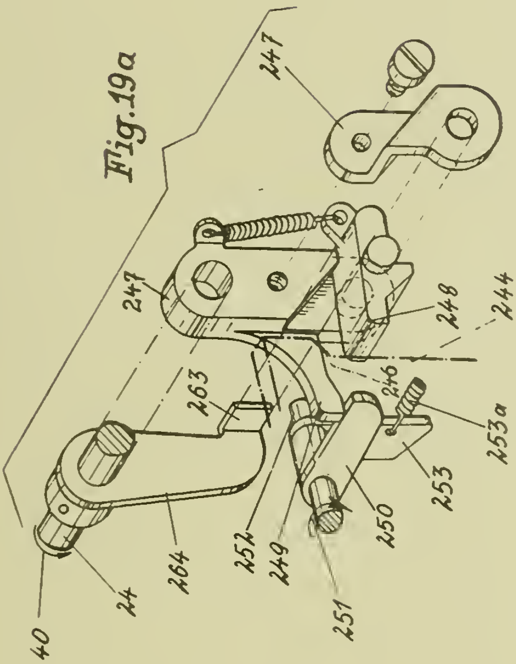


Fig. 19a

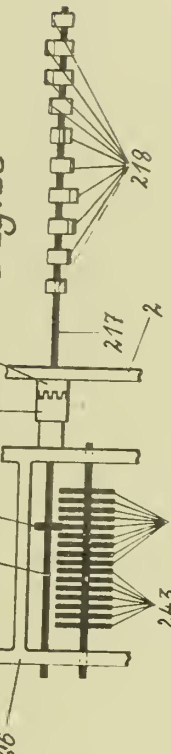


Fig. 23

Inventors,
R. Anschütz
E. H. Kummel

By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.
338,272
22 Sheets-Sheet 20

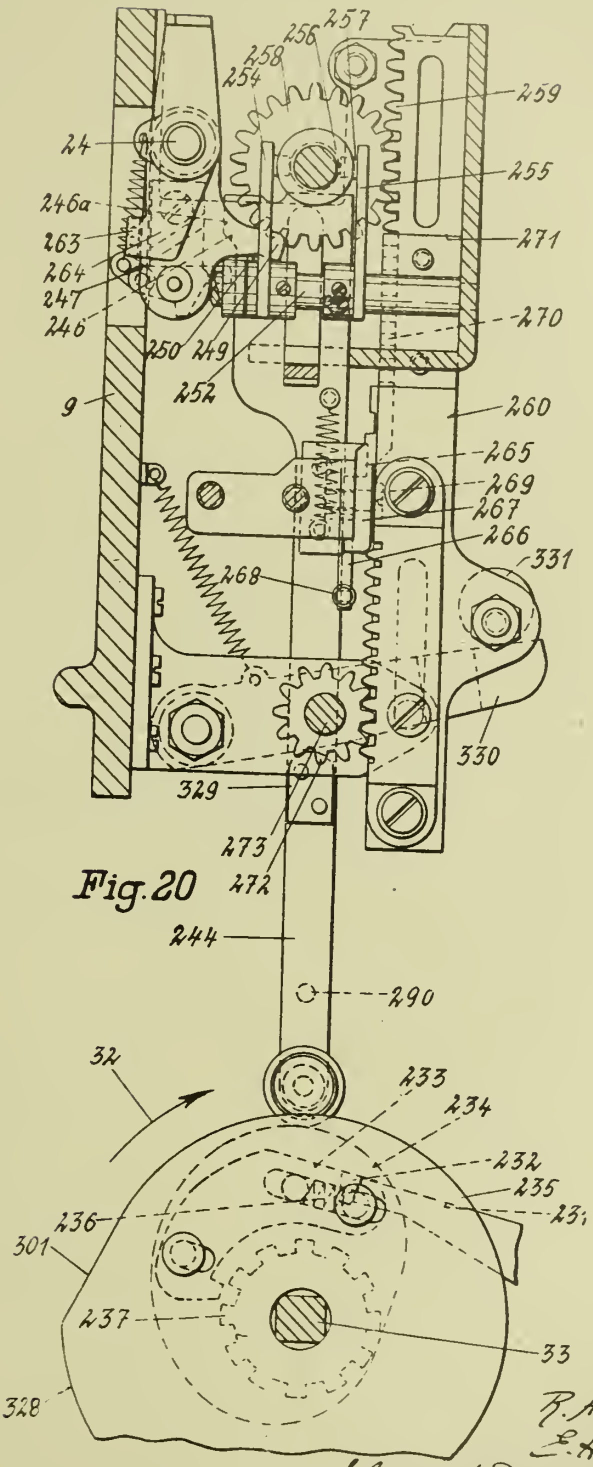


Fig. 20

Inventors,
R. Anschütz &
E. H. Kammel
By: Glascock Downing & Seebold
Atts.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL
BOOKING MACHINE, PARTICULARLY
TYPEWRITING-CALCULATING
MACHINE, EQUIPPED WITH
TOTAL-TAKING MECHANISM
Filed May 31, 1940

Serial No.

338,272

22 Sheets-Sheet 21

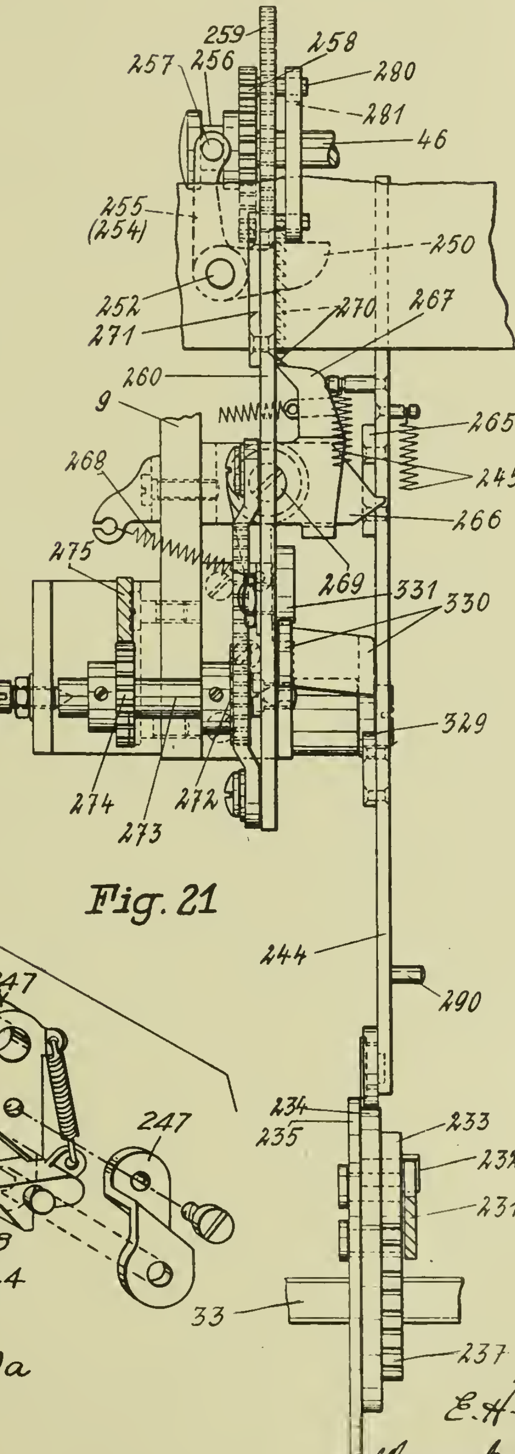


Fig. 21

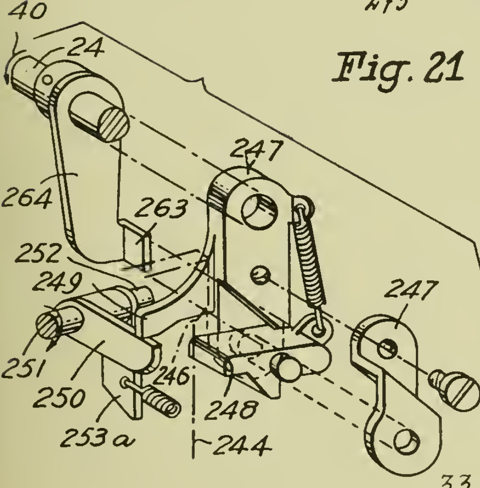


Fig. 19a

Inventors,
R. Anschütz &
E. H. Kummer

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

BOOKING MACHINE, PARTICULARLY TYPEWRITING-CALCULATING MACHINE, EQUIPPED WITH TOTAL-TAKING MECHANISM

Filed May 31, 1940

Serial No. 338,272

22 Sheets-Sheet 22

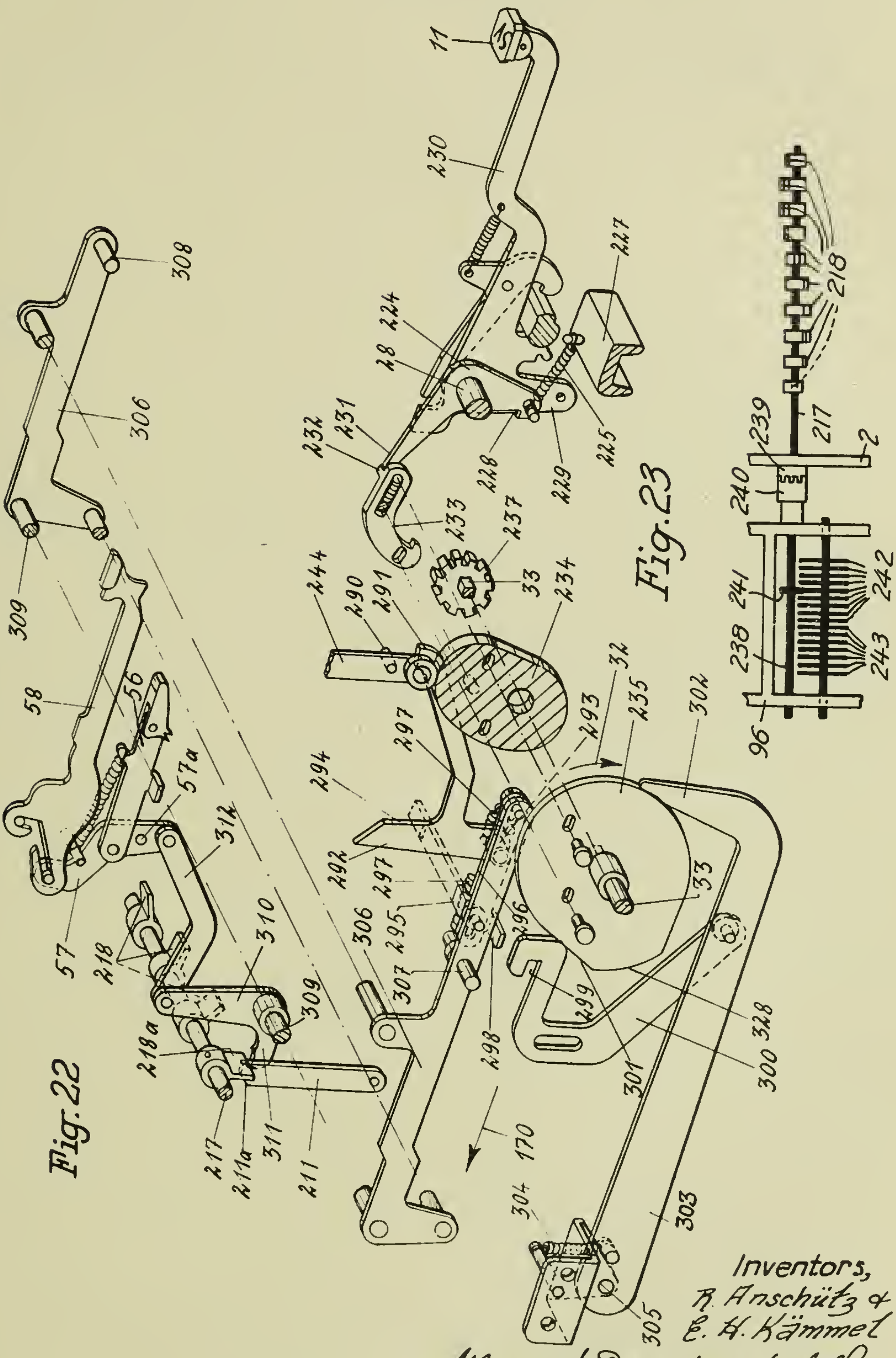


Fig. 22

Fig. 23

Inventors,
R. Anschütz &
E. H. Kämmel

By: Glascock Downing & Seebold
Attys.

Published May 25, 1943 Serial No. 338,695

ALIEN PROPERTY CUSTODIAN

APPARATUS FOR RECORDING THE SPEED OF A VEHICLE

Charles Hilaire Henri Rodanet, Neuilly-sur-Seine, France; vested in the Alien Property Custodian

Application filed June 4, 1940

The present invention has for object an apparatus for recording the speed of a vehicle. Said apparatus is of the type in which use is made in combination: of a totalising meter, an instantaneous speed indicator and a system for recording said speed.

This apparatus is mainly characterised by the following points applied separately or in any combinations:

(*a*) The recording of the instantaneous speed is ensured by a stylus movable in translation and the position of which is function of that of the index indicating said speed, said stylus moving opposite a strip of paper which unwinds at a reduced speed, proportional to that of the vehicle and transversely to the displacements of the stylus, the indications traced by the latter being visible through an opening or notch formed in the dial of the apparatus.

(*b*) The roll of paper is placed in a removable drawer, locked by a safety lock.

(*c*) The paper strip bearing the recording is stored, after passing opposite the observation port, in a housing of the drawer, and said recorded part can be separated from the remainder of the strip after the drawer has been removed.

(*d*) The driving of the paper strip is ensured by clamping it between a resiliently mounted roller and a driving roller the shaft of which comprising a toothed wheel located outside the drawer and which comes in engagement with a corresponding driving wheel kinematically connected to the transmission shaft of the recording speedometer.

(*e*) A cam, adjustable in position, kinematically connected to the index indicating the instantaneous speed, acts, as soon as a given speed is reached, to close the circuit of a signalling lamp placed on the apparatus.

(*f*) The casing of the apparatus, provided with a protecting glass plate, holds the signalling lamp which is subjected to the action of a spring, in position, after assemblage on the base plate.

(*g*) The casing is locked in position, by pivoted bolts urged to open position by a spring and held in locked position behind projections or abutments of the casing, through the medium of screws permanently mounted on said bolts.

The invention also extends to other particular points which will appear in the following text given with reference to the accompanying drawing, by way of example only, in which:

Fig. 1 is a general elevation with section made according to line I—I of Fig. 2.

Fig. 2 is a section made according to line II—II of Fig. 3 or of Fig. 5.

Fig. 3 is a section made according to line III—III of Fig. 2 or of Fig. 5.

Fig. 4 is a section made according to line IV—IV of Fig. 2 or of Fig. 5.

Fig. 5 is a side view, the drawer being removed.

Fig. 6 is a section made according to line VI—VI of Fig. 1 or of Fig. 5.

Fig. 7 is a section made according to line VII—VII of Fig. 3 or of Fig. 5.

Fig. 8 is a section, on an enlarged scale, made according to line VIII—VIII of Fig. 4.

Fig. 9 is a front view of the apparatus, but on a smaller scale.

Fig. 10 is a general perspective view, the drawer being partly disengaged.

The recording speedometer, illustrated by way of example only, comprises a base plate or rear platen **1**, a front platen **2** and an intermediate platen **3** extending only in the upper region. The rear plate **1** and the intermediate platen **3** are connected by rods **4** and the front platen **2** is connected to the intermediate platen **3** by rods **5**. Moreover, between the front and rear platens **2** and **1**, below the intermediate platen **3** is arranged a U-shaped wall **6** the bottom **6**^{a} of which is rigidly secured to the rear plate **1** and the lateral walls or branches **6**^{b} of which extend up to the front platen **2** so as to constitute a rectangular channel or tunnel **7** (Fig. 5) in which can be engaged, by a movement of translation, a drawer **8**.

In front of the platen **2** is arranged a dial **9** provided with a lower notch **10** and an upper port **11**, said dial being secured in position on said platen **2** by rods **12**. A casing **14**, fitting over the base plate **1**, is provided with a protecting glass plate **15** and it is held stationary in position by pivoted bolts **16**. Said bolts **16**, two in number, are oppositely arranged and they are pivoted at **17** on the base plate **1**. Said bolts, the inoperative position of which is more particularly illustrated in Fig. 7, are constantly urged in said position by a common spring **18**. On said bolts are screwed screws **19**, passing through oblong ports **20** formed in the base plate **1** and which cannot be completely disengaged from the bolts owing to the fact that they each comprise a stop pin **21**.

The angular displacement, in the direction of the arrows **22** of the bolts **16** is determined by screwing the screws **19**, the ends of said bolts engaging with inner projections or stop abutments **23** rigid with the casing **14** so as to prevent

the dismantling of said casing which is rigidly held in position on the base plate 1.

The recording speedometer comprises, in the usual manner, a drive 25 controlling, through the medium of suitable means and which are of no importance for the invention, on the one hand, a totalising meter the indicating drums of which are illustrated at 26 and, on the other hand, an index 27 indicating the instantaneous speed, moving over the dial 9. The intermediate movement transmitting mechanisms interposed between the drive 25, the drums 26 and the spindle of the index 27, are illustrated in the drawings but will not be described as they are of the type currently used in the art and the improvements forming the subject-matter of the present application do not relate to these mechanisms. It will be noted that the indications given by the totaliser 26 are visible through the port 11 provided at the upper part of the dial 9.

According to the invention, the control of a shaft 30 journalled in the drawer 8 is derived from the drive 25. This transmission is effected by a shaft 31 cut so as to constitute a worm meshing with a set of teeth 32 formed at the end of a shaft 33 carrying a pinion 34 meshing with a pinion 35. On the shaft 36 of pinion 35 is rigidly secured a pinion 37 which is more particularly shown in Fig. 5 and which projects within the channel 7. When the drawer 8 is mounted in position in the channel 7, a pinion 39, fast on the shaft 30, engages with the driving pinion 37.

The shaft 30, which is thus rotatively driven at a reduced speed but proportional to the speed of the drive 25, is devised to constitute two smooth co-axial rollers 40 and 41 and an intermediate milled roller 42 for effecting the feeding of a paper strip 43 (Fig. 6). This strip 43, which is previously wound to form a roll 44, engages at its unwinding end between a counter-roller or pressure roller 45 and the triple roller 40, 41 and 42, the roller 45 being arranged opposite the milled roller 42. Said pressure roller 45 is journalled in slide-blocks 46 movable in translation in corresponding perforations formed in a stay member 47 of the drawer 8. Said slide-blocks 46 are constantly urged in one direction, towards the roller 42, through the medium of a spring 48 taking a bearing, on the one hand, on the head of a screw 49, mounted on the stay member 47, and, on the other hand, on a plate 50 pressing at its ends on the two slide-blocks 46. The paper strip 43 is thus fed by the roller 42 against which it is pressed by the roller 45 so as to move in the direction of the arrow 52. After passing between the roller 42 and the roller 45, the strip and the recording thereon is stored in a housing 54 of the drawer 8 as more particularly shown in Fig. 6.

Before engaging between the roller 42 and the roller 45, the strip 43 passes over a guiding roller 55 and on a recording table 56, the recording stylus 57 being pressed on the strip 43 resting on said table 56.

The paper roll 44 is mounted on a spindle 58 engaged, by means of lateral grooves 59, in the drawer 8, said spindle being pressed against the bottom forming bearings of said grooves by a roller 60 resiliently held on the periphery of the roll 44.

Said roller 60 is mounted on a resiliently distortable wire 61 pivoted and wound on a shaft 62 mounted on the drawer and which takes a bearing at 63 on the bottom 64 of the housing 54. For mounting the roll 44 in position, the roller 60 and the wire 61 are lifted in the direction of the arrow 65, the roller 60 resuming the position illustrated in Fig. 6, after the roll of paper 44 has been mounted in position. It will be noted that the peripheral roller 60 holds the paper roll 44 in position while ensuring a slight braking action so as to avoid the accidental unwinding of the paper roll 44.

The stylus 57 is movable in translation at right angles to the direction of the displacement of the strip 43. Said stylus 57 is rigid with a rod 57ª rigidly mounted on a rack 66 guided in translation and with which constantly meshes a pinion 67 meshing with a pinion 68 rigidly secured on the shaft 69 of the index 27 indicating the instantaneous speed; the stylus and its rack are restored to the position of rest by a long spring blade 65 passing over a pulley 65ª.

With the pinion 68 also meshes a wheel 70 on which is rigidly secured, in an adjustable manner, a cam 71 which acts, as soon as the instantaneous speed has reached a given value, on a rocking arm 72, pivoted at 73 and constantly urged against said cam by a spring or any equivalent means. Said rocking arm 72 carries a contact member 74 which engages, when the arm 72 has moved sufficiently between contact blades 75 and 76, in order to close the circuit of a signalling lamp 77. Said lamp 77 is clamped between two resilient distortable contact rods 78 and 79. The rod 78 is connected to the source of current and the rod 79 is constituted by the extension of the contact blade or rod 75, the blade 76 being connected to earth.

It will also be noted that the lamp 77, which is engaged in an insulating member 80 secured on the platen 2, is constantly urged by a resiliently distortable blade 81 acting on its inner end 82, against a red signalling glass plate 83 secured on the front face of the casing 14.

Another glass plate 83ª symmetrical to the glass plate 83 relatively to the vertical axial plane, is arranged opposite a spare lamp 77ª.

The drawer 8 is locked in position by a latch 90 (Fig. 3) constantly urged in unlocked position by a spring 91 and which can press behind an abutment 9ª rigid with the drawer 8. Said latch 90 is brought into locking position, in antagonism to the action of the spring 91, as more particularly shown in Fig. 3, by a cam 92 of a safety bolt 93 actuated by a key 94. It will be noted that the drawer 8 is constantly held on the lower face of the channel 7 by a spring 95 so as to prevent any vibration and allow an accurate recording.

On the dial 9 is provided a reference mark 96 indicating to the driver of the vehicle the upper speed limit which the vehicle must not exceed.

The use of the recording speedometer previously described is as follows:

The owner of the lorry, after placing the paper roll 44 in position in the drawer 8, passes the end of the strip 43 between the driving roller 42 and the pressure roller 45. He then engages the drawer 8 in the channel 7 and he locks said drawer in position as shown in Fig. 3 by actuating the key 94 which he keeps. The placing in position of the drawer 8 has automatically caused the pinion 39 fast on the shaft 30 to mesh with the driving pinion 37.

If the driver of the vehicle exceeds for instance the speed of 65 kilometers an hour, indicated by the reference mark 96, he is warned

thereof, on the one hand, owing to the fact that the index 27 passes beyond said reference mark and, on the other hand, by the lamp 77 being placed in circuit and which lights. Furthermore, the instantaneous speed of the vehicle is recorded at every instant on the strip 43 which preferably bears longitudinal lines marked out in kilometers per hour, so that an excess of speed is immediately recorded, said recording then passing opposite the notch 10 formed in the dial.

When the vehicle has returned, the owner can verify the recording by pulling out the drawer. He then separates the recorded part and replaces the drawer which is locked again.

It is obvious that the embodiment described and illustrated is given herein only by way of indication and not in a limiting sense. All modifications or changes which do not alter in any way the main features above set forth or the desired result remain included in the scope of the present invention.

CHARLES HILAIRE HENRI RODANET.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

C. H. H. RODANET
APPARATUS FOR RECORDING THE SPEED OF A VEHICLE
Filed June 4, 1940

Serial No. 338,695

4 Sheets-Sheet 1

Fig.1.

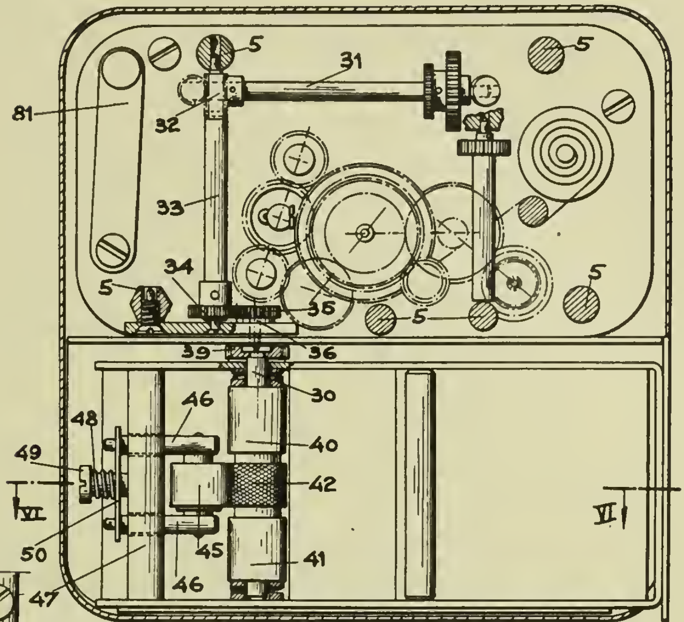
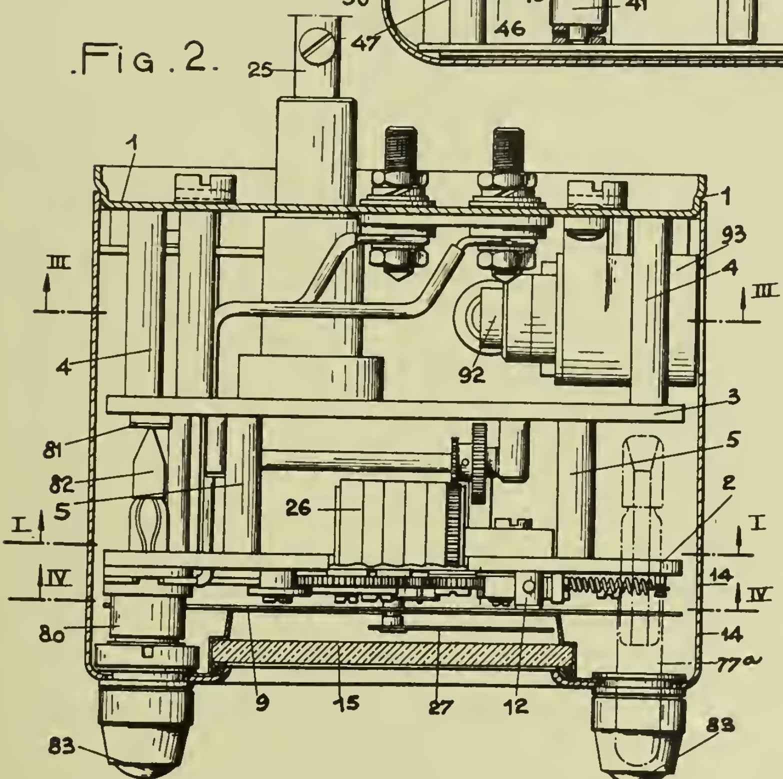


Fig.2.



INVENTOR:
CHARLES HILAIRE HENRI RODANET
BY Haseltine, Lake & Co.
ATTORNEYS

PUBLISHED

MAY 25, 1943.

BY A. P. C.

C. H. H. RODANET

APPARATUS FOR RECORDING THE SPEED OF A VEHICLE

Filed June 4, 1940

Serial No. 338,695

4 Sheets-Sheet 2

Fig. 3.

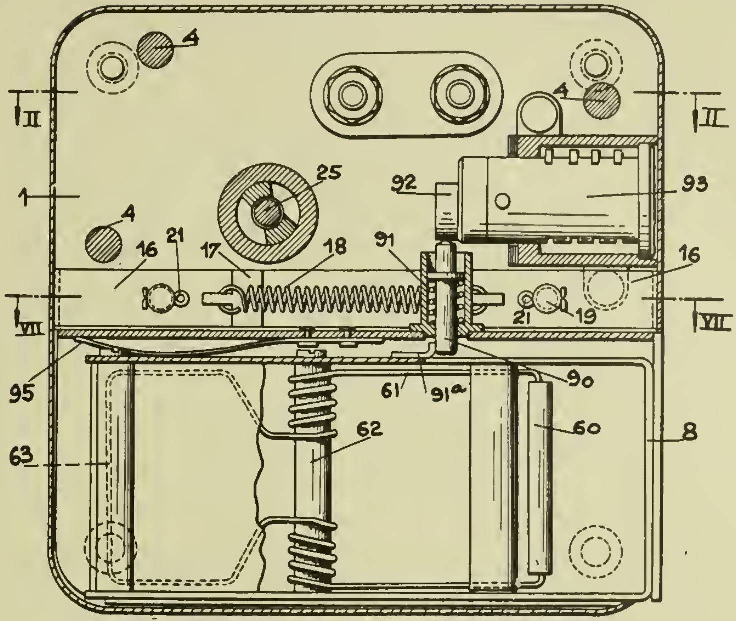
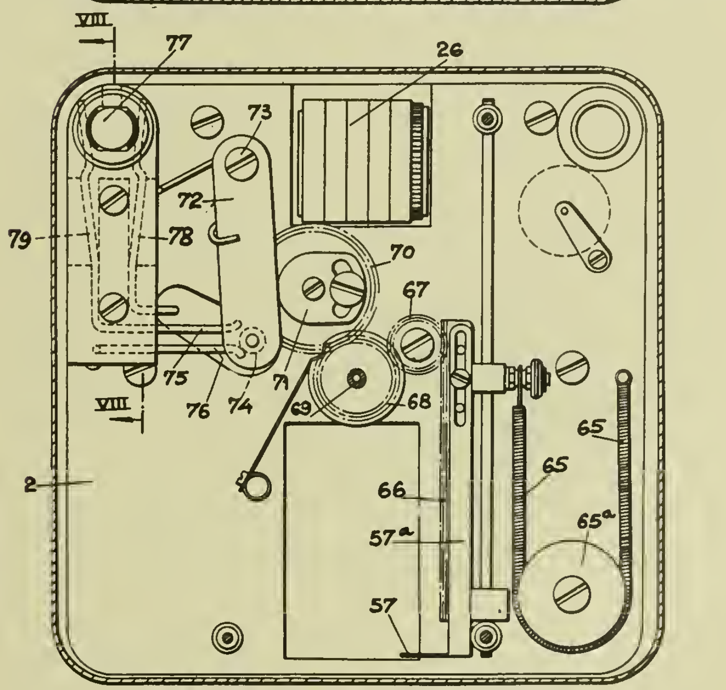


Fig. 4.



INVENTOR:

CHARLES HILAIRE HENRI RODANET

BY Haseltine, Lake & Co.

ATTORNEYS

PUBLISHED
MAY 25, 1943.
BY A. P. C.

C. H. H. RODANET
APPARATUS FOR RECORDING THE
SPEED OF A VEHICLE
Filed June 4, 1940

Serial No.
338,695
4 Sheets-Sheet 3

Fig.5.

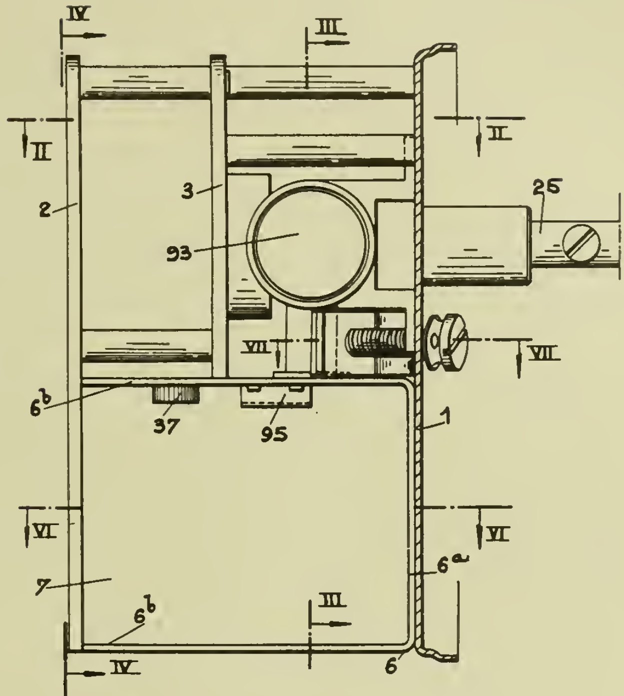


Fig.6.

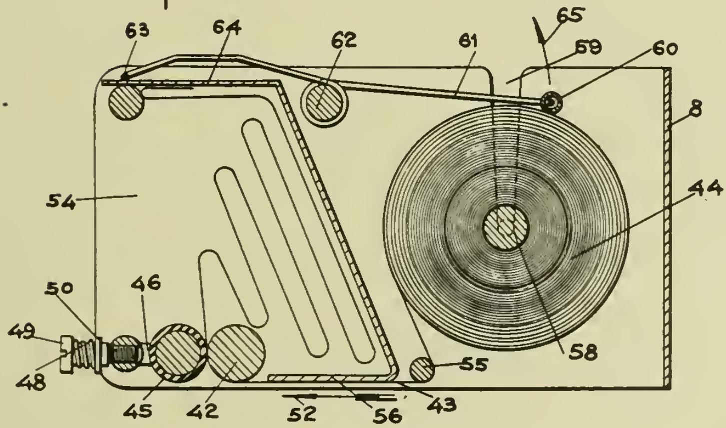
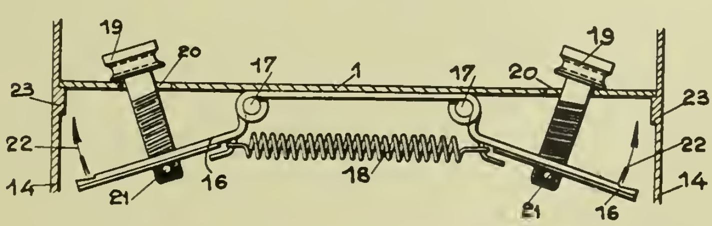


Fig.7.



INVENTOR:
CHARLES HILAIRE HENRI RODANET
Haseltine, Lake & Co.
ATTORNEYS

PUBLISHED

MAY 25, 1943.

BY A. P. C.

C. H. H. RODANET
APPARATUS FOR RECORDING THE
SPEED OF A VEHICLE
Filed June 4, 1940

Serial No.
338,695

4 Sheets-Sheet 4

Fig. 8.

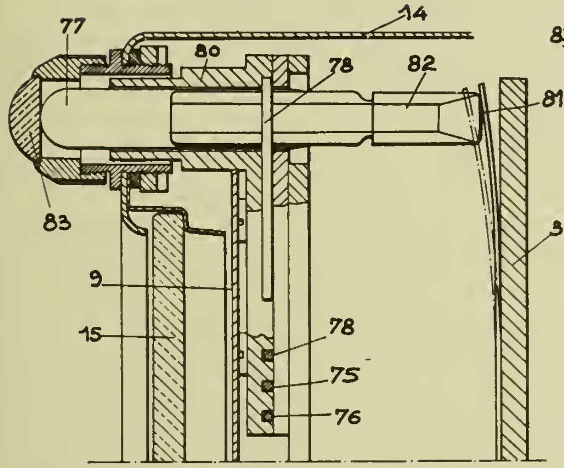


Fig. 9.

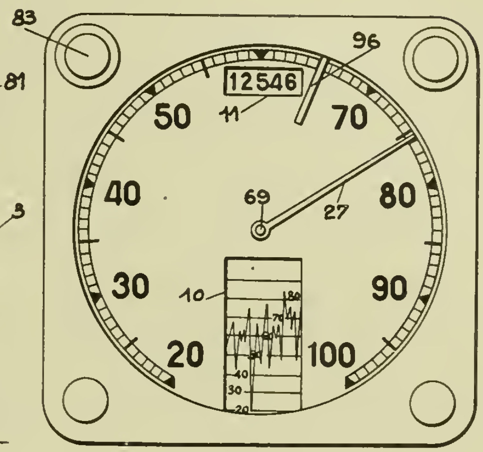
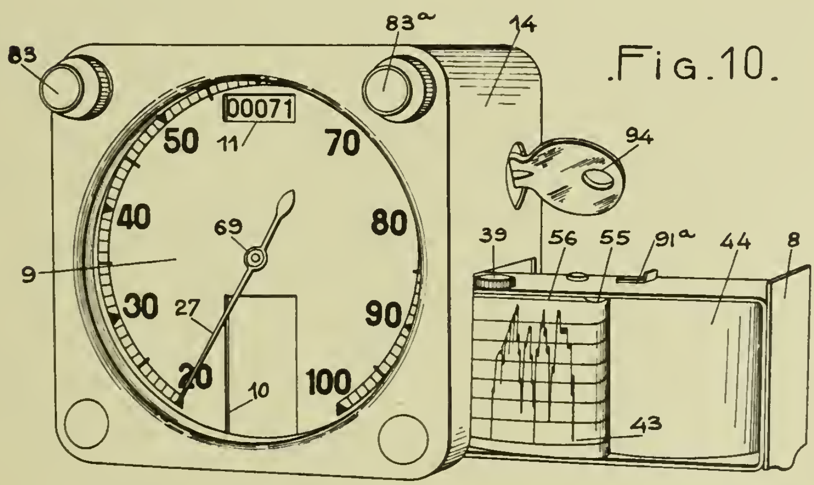


Fig. 10.



INVENTOR:
CHARLES HILAIRE HENRI RODANET
BY Haseltine Lake & Co.
ATTORNEYS

Published May 25, 1943

Serial No. 340,300

ALIEN PROPERTY CUSTODIAN

BEARING SLEEVE FOR ROTARY SPINDLES IN MACHINE TOOLS

Robert Wölfle, Berlin-Pankow, Germany; vested in the Alien Property Custodian

Application filed June 13, 1940

The present invention relates to bearing bushes or sleeves for rotating spindles of machine tools, which can be moved axially, particularly to boring spindle bushings which move longitudinally in the spindle rod or head stock housing.

The known spindle sleeves in boring or milling machines and the like, which can be moved in the direction of feed, are of circular or prismatic section being guided with extremely little play in a bore hole of suitable diameter of the spindle rod housing.

The spindle resting in the sleeve is moved at variable speed. The speed range of the boring spindle in modern boring machines lies between 50 and 2000 r. p. m. in order to permit drilling holes of large and small diameter with the same boring spindle as well as to execute the fine-boring process. When changing the speed, the temperature of the boring spindle bearing will, of course, vary accordingly. If the boring spindle runs without interruption at high speed for a longer time, the spindle sleeve will expand owing to the heat of the bearing, so that it can be moved in the bore hole only with difficulty and even might become locked. On the other hand, it is not advisable to adjust the guide play between the boring spindle sleeve and the bore hole from the start so that even with excessive heat of the bearing the spindle sleeve could yet be easily moved, for in that case the position of the boring spindle axis would become inaccurate owing to the excessive guide play of the bushing when drilling at a slow range of speed with consequent low temperature of the bearings. This condition cannot be suffered, especially with coordinate boring machines (jig boring machines).

It is an important object of the present invention to create a spindle sleeve which does not lock in its guide channel owing to heat expansion and does not cause dislocation of the axis of the spindle resting in the sleeve. The instant invention briefly stated consists in that the spindle sleeve in the housing is provided with at least three guide bars of rods which are distributed on the circumference of the sleeve and are running parallel to the spindle axis. Each of these guide bars has a parallel pair of guide surfaces and sufficient radial play so as to permit of radial displacement of the said guide surfaces between the spindle sleeve and the housing, owing to heat expansion.

Thus, the expansion of the sleeve caused by the heat from the boring spindle bearings will not affect its guiding control and the spindle sleeve will be guided accurately and easily at any desired rate of speed of the boring spindle.

The invention will be bėtter understood by reference to the following detailed description in connection with the accompanying drawing showing by way of example and purely schematically some embodiments of the invention and in which:

Fig. 1 is a longitudinal section through the boring spindle head of a boring machine.

Fig. 2 is a cross section on line I—I of Fig. 1.

Fig. 3 shows the side view of a spindle sleeve of different type, with the spindle rod housing being removed.

Fig. 4 is a section according to line II—II of Fig. 3, but including the spindle rod housing.

Figs. 5 and 6 show vertical sections of other types of spindle sleeve.

Similar characters of reference denote similar parts in the different figures.

Referring to the drawings, item 1 is the head stock or boring spindle rod housing of a boring machine, only partly shown. The head stock 1 consists of the front part 2 and the rear part 3, which are screwed together. The dividing line is indicated at 4. The hollow boring spindle sleeve 5 in which the boring spindle 6 is mounted to rotate is guided to move longitudinally in the spindle rod housing. The boring spindle bearings consist of the lower roller bearing 7, the upper roller bearing 8 and the roller bearing 9 with shoulders, connected in series. The boring spindle 6 has a cone 10 at its lower end for receiving tools, or an intermediary sleeve 11 to accommodate the tools not shown in the drawing. The upper end of the boring spindle 6 is formed with a cone shaped recess 12 which is engaged by the shaft 13 and in this way imparts its rotary motion to the boring spindle. The shaft 13 rests in the sliding bearings 14, 15 in the boring spindle rod and can be selectively driven by the gears 16, 17 or by the pulley 18. The feeding motion is imparted to the boring sleeve 6 by way of the gear pinion 21 and the ratchet 20. The gear 21 is mounted on shaft 19 which may be selectively operated manually, by way of the handwheel 22, or mechanically, by way of the worm gear 23, 24. The worm gear 23, 24 is driven from the boring spindle drive by way of a change gear and can be connected and disconnected through the hand wheel 22.

The guiding of the boring spindle sleeve 5 consists of several separate longitudinal guides. Fig. 2 shows four such longitudinal guides. Narrow, rectangular guide strips or bars 25 of rec-

tangular cross section arranged radially or starfashion with respect to the axis of the boring spindle 6 have been provided for this purpose. The guide bars 25 are arranged to form the shape of a cross being set at right angles to each other and are mounted to move along suitable counter-guide surfaces 26 of the spindle rod housing 1. Two of the guide strips 25 are located in the housing part 2 and the remaining two in the housing part 3. Suitable radial play 27 and 28 has been provided between the boring sleeve and the spindle rod housing as well as between the front surface 25*a* and the guide strip 25 in the housing. It follows that only the lateral surfaces 25*b* of each guide strip 25 take part in the guiding action and can be influenced by any outside forces. Since none of the portions of the guiding means exerts any radial pressure with regard to the housing, owing to the spaces 27, 28 affording sufficient play, the body of the sleeve can expand uniformly in a radial direction when the bearings become heated. The guides 25, 26 have relatively low lateral guide surfaces 25*b*, the total of which will amount to only a part of the total of the circumference of the spindle sleeve 5, even if this circumference is assumed to be cylindrical. Consequently, the heat transfer to the boring spindle rod is very small.

The width of the guide strips 25, which means the distance from one lateral guide surface to the other, is likewise comparatively small. The heat expansion of the guide strips perpendicularly to the guide surfaces 26 will therefore be smaller than the guide play allowed for this purpose. Besides, the interstices 27, 28 provide for sufficient heat removal which can still be increased by artificial air draught. It may therefore be said that clogging of the spindle sleeve 5 in its guide channel as well as dislocation of the boring spindle shaft are avoided with absolutely certainty.

Where an especially strong heating of the bearings may be expected owing to the spindle running at high speed, so that also the expansion of the guide strips 25 in perpendicular direction to the guide surfaces 26 should be taken into account. I may provide guide rollers 29 in recesses 30 in each of the four guide surfaces 25, as indicated in Figs. 3 and 4. Said rollers which may be simple ball bearings are mounted on supporting pins 31 fitted in the bushing 5. The shaft of the supporting pin 31 is arranged excentrically to the shaft of the roller 29, so that by turning the pin 31 the roller can be adjusted and placed against the guiding surface 26. The wall of the housing has certain apertures, not shown, opposite the rollers, so as to make these accessible from the outside. In this way a combined sliding and guiding control of the rollers is provided. The heat expansion of the guide bar 25, perpendicularly to the guide surface 26, merely causes a resilient action of the free end of the supporting pin 31 so that the boring spindle sleeve 5 can under all circumstances be easily adjusted.

In the embodiment shown in Figs. 1 and 2, the ratchet 20 for feeding the sleeve 5 lies between two guide rods 25. This arrangement is not compulsory and can be changed relative to the position of the ratchet, as shown in Fig. 3. In this modification one of the guide rods has been recessed and the ratchet has been placed into the bottom of the recess. In the embodiment illustrated, the guide rods 25 do not extend over the whole length of the sleeve 5 in the most advanced position. In the case of shorter sleeves the length of the guide rods 25 will be adapted to that of the sleeve.

Fig. 5 shows the identical arrangement of the guide rods as in Fig. 4, with the difference, however, that the guide rods 25 are attached to the housing parts 2 and 3 and that the guide surfaces 26 are worked into the sleeve 5. The play of the plain guide surfaces is adjusted by the longitudinal adjustment strips 35.

Fig. 6 shows a design in which only one guide surface of each guide rod 25 lies exactly radially to the axis of the boring spindle.

Fig. 7 shows a design with three single guides. The guide rods 25 have been fastened in the housing, same as in Fig. 5, and the counter-guide surfaces 26 have been provided in recesses in the body of the sleeve 5.

If desired, the guide rods 25 may be formed integral with the body of the sleeve 5, or with the housing 2, 3, respectively (see Figs. 5 and 7). As mentioned before, the housing for the boring spindle sleeve 5 should preferably consist of two parts (front part 2, rear part 3). This has the advantage that the guide surfaces can be machined more easily, also the assembling is thereby facilitated.

All designs illustrated and described above show spindle sleeves having the longitudinal guides 25, 26 uniformly spaced from each other. Certain deviations from this uniform distribution on the circumference of the spindle sleeve can be made in actual practice. Likewise, certain smaller deviations from the symmetrical arrangement of the longitudinal guides with respect to the axis of the cross or, in case of three single guides, Fig. 7, with respect to the radial planes, are permissible.

My novel spindle sleeve is not restricted to the use in boring machines only, but it can be applied in all cases where difficulty with sliding or clogging of the spindle sleeve has been experienced or may be expected owing the temporarily varied heating of the bearings. The spindle sleeve can be arranged vertically, horizontally or at another angle.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

ROBERT WÖLFLE.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. WÖLFLE
BEARING SLEEVE FOR ROTARY SPINDLES
IN MACHINE TOOLS
Filed June 13, 1940

Serial No.
340,300

2 Sheets-Sheet 1

Fig. 1

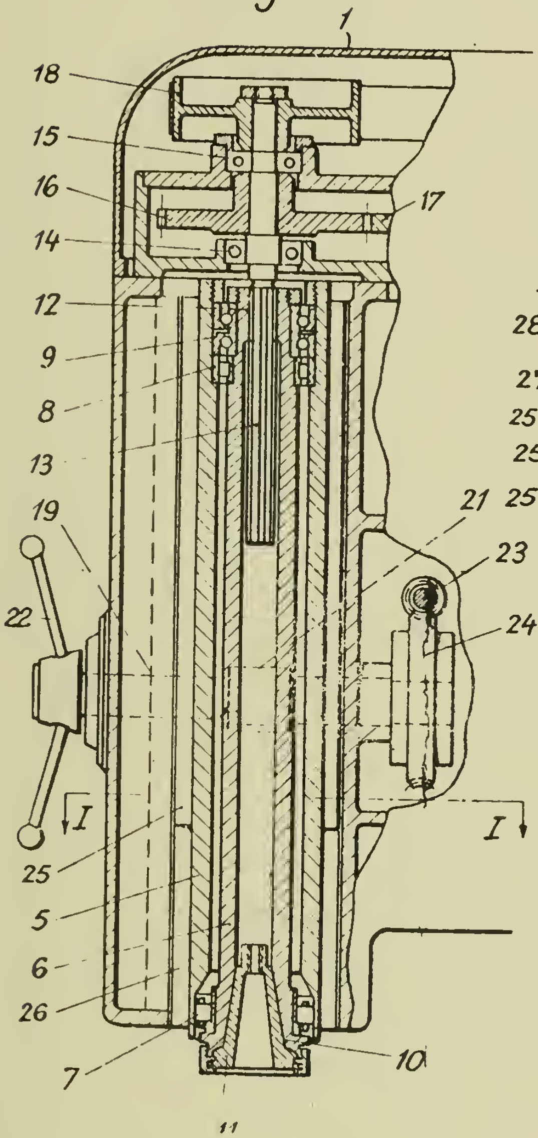
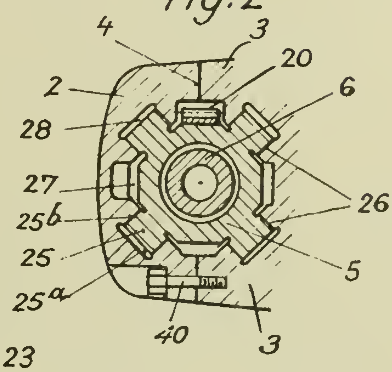


Fig. 2



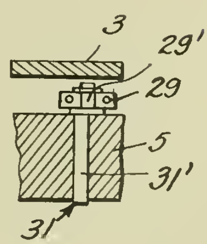


Fig. 4a.

INVENTOR
Robert Wölfle
BY
John a Kehlenbeck
ATTORNEY

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. WÖLFLE

BEARING SLEEVE FOR ROTARY SPINDLES
IN MACHINE TOOLS

Filed June 13, 1940

Serial No.
340,300

2 Sheets-Sheet 2

Fig. 3

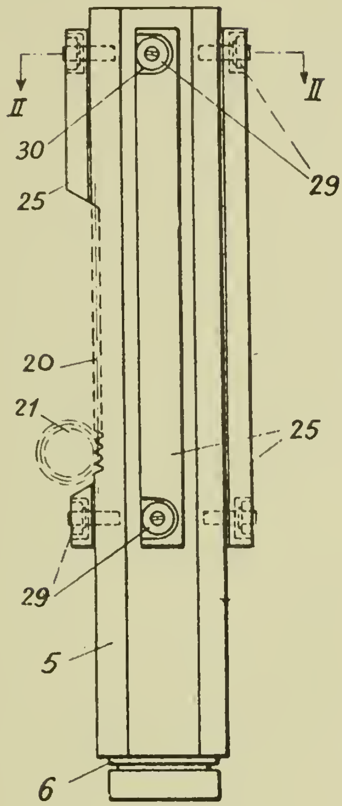


Fig. 4

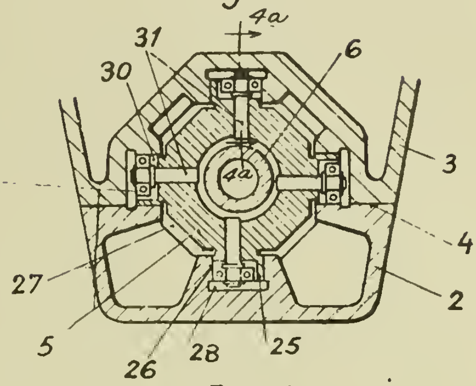


Fig. 5

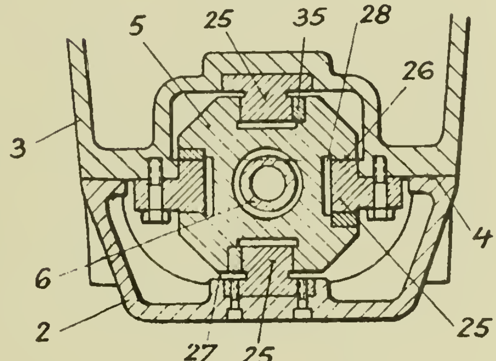


Fig. 6

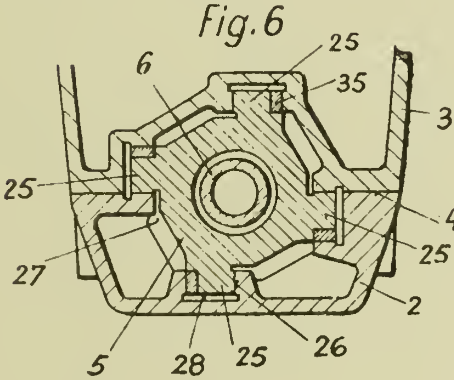
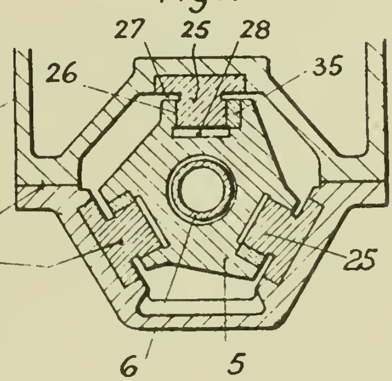


Fig. 7



INVENTOR
Robert Wölfle
BY
John A. Kehlenbeck
ATTORNEY

Published May 25, 1943 Serial No. 340,336

ALIEN PROPERTY CUSTODIAN

AIRCRAFT WING

Emil Scheler, Vegesack, near Bremen, and Adolf K. Rohrbach, deceased, late of Bremen-Oberneuland, Germany, by Gustav Edzard, administrator, Bremen, Germany; vested in the Alien Property Custodian

Application filed June 13, 1940

This invention relates to an aircraft wing of the type described in our co-pending application Ser. No. 218,010, filed July 7, 1938, which is built up around a single spar in the form of a hollow closed body constructed to resist bending and twisting forces and comprises also front and rear wing parts completely enclosing the spar and secured thereto, the ribs of said parts being easily attachably and detachably fastened to the spar and the skin, between said front and rear parts, forming joints which extend transversely to the direction of flight and are preferably located at the rear wall of the spar.

The present invention has for its object to build up the front and rear wing parts in the simplest possible manner to save time, to provide for their easy attachment and detachment within a relatively short time, and to reduce the cost of production and the weight of the wing. For this purpose, some of the ribs supporting the covering of the front and rear wing parts are strengthened and braced to serve as special supporting ribs by means of which the front and rear parts are detachably secured to the spar. As the forces acting upon the wing are transmitted by these supporting ribs to the spar, the remaining ribs of the front and end portions may be made less strong and function only in an auxiliary manner for taking up slight transverse forces and also air forces that have merely a local effect upon them. This involves considerable simplification of production with respect to the attachable parts and a saving in material.

The supporting and auxiliary ribs are interconnected near the spar by longitudinal sections extending in the longitudinal axis of the wing and at more distant points from the spar by auxiliary supports extending parallel to the spar, both the auxiliary supports and the longitudinal profiles serving for transmitting the forces acting upon the wing to the supporting ribs for transmission to the spar. The longitudinal profiles aid also in stiffening the edges of the skin of the front and rear parts with which they are connected for instance by riveting.

Further saving in weight can be effected by detachably arranging on the spar, besides the supporting ribs, one or more auxiliary ribs or, at a few points, the longitudinal sections which interconnect the ribs.

The choice of ribs to be strengthened and to serve as special supports is optional. For example, if the front and rear wing parts are subdivided transversely to the direction of flight, it is advisable to strengthen the ribs limiting these parts.

In order to render accessible the fastening points for the supporting ribs, auxiliary ribs or longitudinal sections the coverings of the front and rear wing parts near these points possess oval, circular or similarly formed clearances which may be closed by easily detachable flaps, etc. Such clearances are dispensed with at points where connections found for instance at the front part of the spar do not require special acessibility. The joints extending transversely to the direction of flight between the skins of the front and rear wing parts need not all to be disposed near the rear or front wall of the spar. When the ribs of the front and rear parts respectively embrace the top and underside of the spar, the clearances may be provided near the rear wall of the spar on the upper side of the wing and near the front wall of the spar on the underside of the wing, in which case the front and rear parts may be articulated to the spar so that they can be turned up and down in known manner. A construction of this kind affords the advantage that complete removal of front and rear parts of the wing to repair control gear, wires, cables, etc. arranged along the side walls of the spar is not necessary any more, since it suffices to loosen the connections on the top or bottom side of the wing. It is also possible of course to have the rib of the front parts embrace the underside of the spar and the ribs of the rear parts surround the top side thereof while the front parts can be turned up and the rear parts turned down.

A further feature of the invention is that the supporting ribs of the front and rear wing parts can be used for supporting ailerons, landing flaps, slats, etc. and special stiffening members for bearing them are not needed.

Furthermore, to prevent fire caused by the engine from spreading over the entire wing the supporting ribs of the front and rear parts adjacent to the engine bearing may be made solid and thereby enabled to fulfill the function of the fireproof bulkheads hitherto in use.

The invention is illustrated by way of example in the accompanying drawing, in which

Figure 1 is a plan view of a portion of a wing constructed according to the invention;

Fig. 2, a cross section of the wing on the line II—II, of Fig. 1;

Fig. 3, a cross section of the wing on the line III—III, of Fig. 1;

Fig. 4, a view showing on an enlarged scale a

manner of connecting the supporting ribs of the front and rear wing parts with one another and with the spar; and

Fig. 5 shows on an enlarged scale a connection of the longitudinal sections to the spar.

The wing is built up of a spar *a* having the form of a closed hollow body constructed to resist bending and twisting forces and of front and rear parts *b*, *c* attached to it transversely to the longitudinal axis of the wing. Ribs *h*, *i* supporting the skin of the front and rear parts *b*, *c* are interconnected near the rear wall of the spar by longitudinal sections *d*, *e* extending in the direction of the longitudinal wing axis and at places more distant from the spar by auxiliary supports *f*. The front wing parts *b* are, moreover, provided with additional longitudinal sections *g* located near the front wall of the spar. The auxiliary supports *f* and the longitudinal sections *d*, *e*, *g* serve for transmitting the forces acting upon the wing to the specially constructed supporting ribs *h* of which three are shown in the left-hand portion of Fig. 1 for fastening the front and rear parts of the wing, the front and rear parts shown to the right in Fig. 1 possessing each only two supporting ribs *h*. As indicated in Fig. 2, the supporting ribs *h* are particularly strong and stiffened by braces. They transmit the main portion of all forces acting upon the wing to the spar *a*, and the remaining ribs *i* are therefore weaker and serve only as auxiliary members for taking up slight transverse forces and locally acting air forces.

The supporting ribs *h* are detachably secured to the spar *a* or to one another at the front wall of the spar *a*, for instance at the points *k*, and at the rear wall thereof at the points *l* provided with flaps or covers. As fastening means serve pins or shear bolts, flanges and bores or other means, as described in our co-pending application Ser. No. 218,010. In the construction shown in Fig. 4 the supporting ribs *h* are connected with the aid of a bolt o having two nuts and arranged in a small support *n* united with the spar *a*.

Fig. 5 shows how the longitudinal sections *d*, *e* interconnecting the ribs *h*, *i* are secured to the spar *a* by means of a screw *s* which can be easily reached through openings *m* in the wing skin.

The joints extending between the front and rear parts *b*, *c* transversely to the direction of flight are covered for instance by arranging the longitudinal sections *d*, *e* so that one slides under the other and thereby causes overlapping of the skins.

EMIL SCHELER.
GUSTAV EDZARD.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

E. SCHELER ET AL
AIRCRAFT WING
Filed June 13, 1940

Serial No.
340,336

Fig. 1

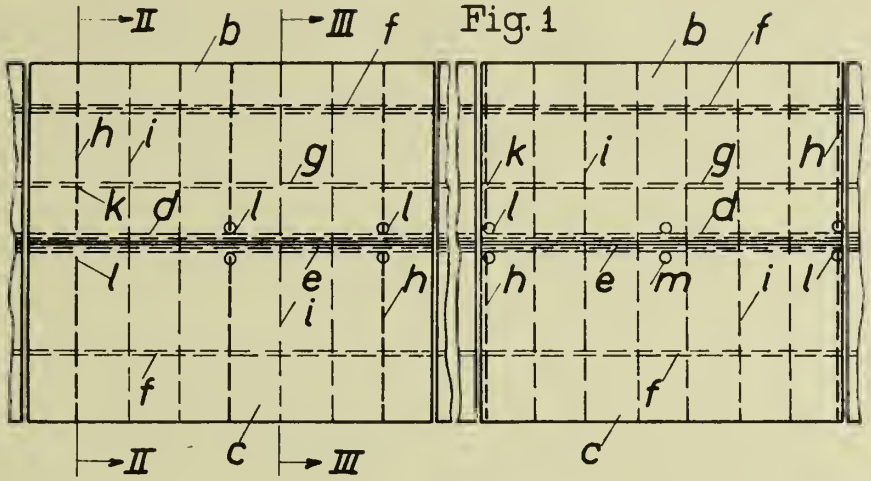


Fig. 2

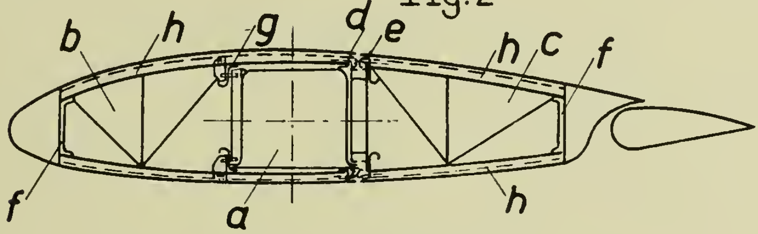


Fig. 3

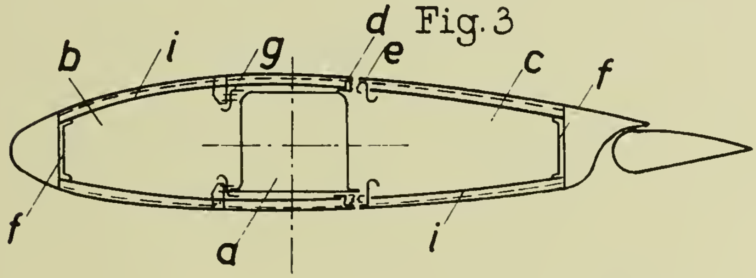


Fig. 4

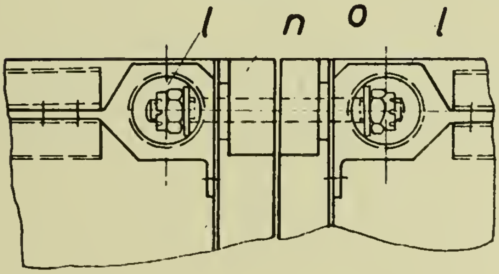
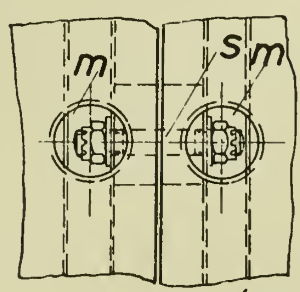


Fig. 5



Inventor:
EMIL SCHELER
By: Richards & Geier
Attorneys:

Published May 25, 1943

Serial No. 340,196

ALIEN PROPERTY CUSTODIAN

PARACHUTE WITH VARIABLE SURFACE

Giuseppe Lisi, Spoleto, Italy; vested in the Alien Property Custodian

Application filed June 12, 1940

Object of the present invention is the realisation of a parachute allowing: 1st the jump of persons or drop of things at a higher speed than the one considered till now as a maximum in the normal use of a parachute: 2d the possibility for the flyer (or airman) to vary at his will and by a simple manipulation the descent speed.

The difficulty till now met with in the use of a parachute in the case of jumps at a high speed consists above all in the high value of the snatch effort a man has to endure. In order to avoid this inconvenience, in the parachutes now used with but one calotte there is no other means but to reduce the surface of the envelope with the inconvenience however of increasing the normal descent speed.

As to the possibility of varying at will the descent speed the solutions till now suggested have not been adapted as they were not practical and too complicated. In the parachute with a variable surface according to the present invention there is offered the realisation of a practical simple solution of the problems above mentioned.

In the accompanying drawings there are shown by way of example two explicative figures.

In Fig. 1 the parachute is illustrated when totally opened that is during an ordinary vertical descent.

Fig. 2 shows the moment of opening when starting from an aeroplane at a high speed.

As illustrated in Fig. 1 the parachute comprises a calotte A and an annular sloping portion B with no solution of continuity.

In the juncture C of the sloping portion B and calotte A the nonresilient cords are united in D from where by means of a nonelastic supporting system L, which may contain a device for the controlled manipulation, they are rejoined to the belt N.

The slope B united with or adjacent to the calotte A is caught on the outside edge M by a series of nonresilient cables assembled in different groups H.

The sections S from H to the attachment E joining the groups H to the belt N consists of a resilient material.

Fig. 2 shows the function of said resilient sections S yielding under the aerodynamic resistance met by the slope B at the starting moment allowing said slope to be temporary tilted till the position R is taken.

Once reached this position the whole resistance of the first air shock is supported by the surface of the calotte alone and consequently by a part of the total surface of the parachute.

While the system formed by man and parachute gradually sinks down towards the normal descent speed the resilient sections S return to the position shown in Fig. 1 so that the slope B also opens in its whole surface offering the maximum resistance in order to obtain a descent at an easy and secure landing speed.

The tilting on high of the slope B produced in the case above mentioned by the aerodynamic resistance may be also obtained in any moment whatever of the normal descent whatever may be the proportion of the tilting by a simple hand control device to be operated at will by the airman.

According to the proportion the tilting has been obtained there will be also obtained a smaller resistant surface and consequently a greater falling speed.

GIUSEPPE LISI.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

G. LISI

PARACHUTE WITH VARIABLE SURFACE

Filed June 12, 1940

Serial No.
340,196

Fig. 1

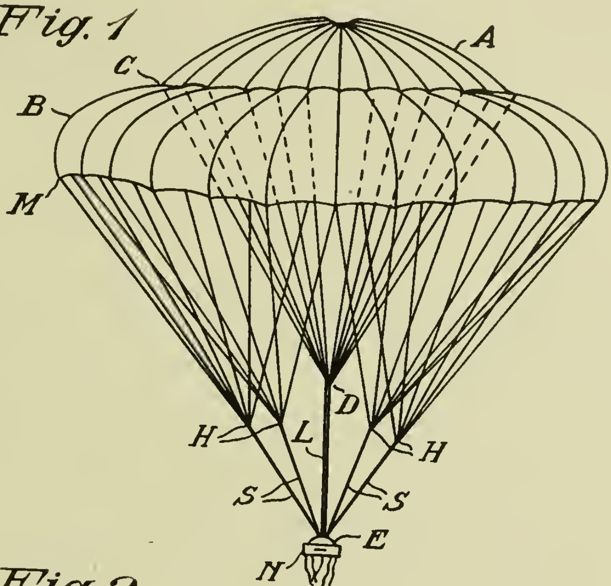
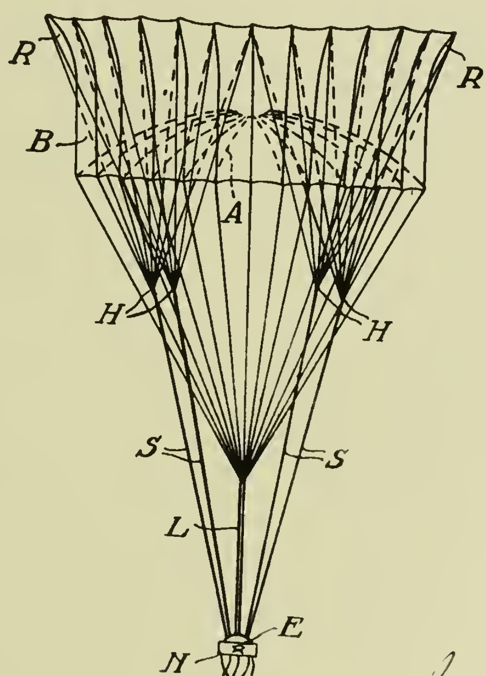


Fig. 2



Inventor:
G. Lisi
By E. F. Wendroth
Atty

Published May 25, 1943

Serial No. 340,456

ALIEN PROPERTY CUSTODIAN

CLOSURE DEVICES

Richard Blau, Jr., Dittersdorf, and Werner Blau, Augustusburg, Germany; vested in the Alien Property Custodian

Application filed June 14, 1940

The invention relates to a closure device which is intended particularly but not exclusively for fuel tanks, cooling water vessels and so forth on power vehicles and is provided with a pressure-equalizing member which is automatically opened when a reduction in pressure occurs in the closed vessel and establishes an equalization of pressure with the atmosphere. According to the invention the pressure equalizing member consists of a spring diaphragm, leaf spring or the like having on the outside and inside a large pressure surface for actuating the air valve controlled by it and of which the entire area is exposed to the outer atmospheric pressure and to the internal pressure in the container. Since the entire area of the diaphragm is exposed to the pressure it responds to every slight variation in pressure.

The new closure at the same time prevents with certainty an unintentional escape of the contents of the vessel while on the other hand it makes an absolutely odourless closure.

Various constructional embodiments of the invention are illustrated by way of example in the accompanying drawings, in which

Fig. 1 shows in vertical section a tank closure with a resilient metal diaphragm,

Figs. 2 and 3 show in section and plan respectively the intermediate plate which is used in the tank closure,

Figs. 4 and 5 show the spring casing in section and plan respectively, and

Figs. 6–8 show three other constructional forms of the closure in section.

Referring to the drawing, in all the forms of construction illustrated **1** denotes the cover which contains the spring case **2** and packing **3**. The case **2** which receives the spring **4** is provided with oppositely situated apertures **5** (Figs. 4, 5, 7 and 8) through which passes the retaining member **6**, which is preferably resilient, and of which the edges engage for example in bayonet fastening grooves provided on the inside of the edge of the opening in the container to be closed.

In the form shown in Figs. 1–6, there is disposed between the cover **1** and the spring case **2** an intermediate plate **7** which is provided with packing **8**. The edge **9** of the plate **7** is clamped between the cover **1** and the spring case **2** and is provided with cut out portions **10** (Figs. 2 and 3) through which air which penetrates into the spring case, for example from below through grooves **27** or the like (Figs. 4 and 5), can reach the space below the cover. In some cases small air inlet openings **11** (Figs. 1 and 6) can be provided in the cover. The spring case **2** is likewise provided with one or more openings **20** through which the air can reach the tank.

The intermediate plate **7** is provided with a central opening **12** through which passes the stem **13** of a plate valve **14** having a seating **15** which bears against a seating surface on the intermediate plate, for example against an annular ridge **16** (Figs. 1–3) or against a plane packing edge **17** (Fig. 6) of the intermediate plate **7**.

Above the intermediate plate **7** is disposed the pre-tensioned metal diaphragm or metal spring **18** to which the plate valve **14** is connected by means of the valve stem **13** which is provided on top with a button **19**. The pre-tensioned diaphragm can consist for example of a circular metal disc of spring steel.

The method of operation is as follows:—

When, owing to a fall in the level of the liquid in the container, the air becomes rarefied, the thin metal diaphragm or metal spring **18** of which the entire surface is exposed to the reduced pressure is bent inwards slightly. The valve **14** is thereby opened, so that air enters the container from the outside and pressure equalization takes place. Usually the air inlet is closed by the diaphragm or metal spring owing to its tension. On the occurrence of the least under-pressure in the container a slight bending, i. e. a so-called breathing, of the diaphragm or metal spring takes place, whereby the pressure equalization is effected. The outer air then presses on the large diaphragm or spring surface and its resiliency is so great that a tight closure of the valve is always ensured when pressure equalization occurs and the valve does not operate even with strong vibration, while on the other hand jamming of the valve is obviated and the latter is not sensitive in its action so that it operates only when pressure differences occur.

In the constructional form according to Fig. 7, the diaphragm **18**[1] which consists for example of a corrugated metal disc is inserted between the cover **1** and the spring case **2**, a packing **21** being interposed. In a central opening in the cover **1** is fixed a valve member **22** of which the lower, for example conical, end engages in an opening **29** in the diaphragm **18**[1] and normally closes this opening. The remaining parts of the arrangement are similar to those in the forms previously described and the other parts such as the spring **4** and retaining clip **6** of Fig. 1 have been omitted from the drawing only for the sake of simplicity.

In the constructional form according to Fig. 8 of the drawing, the diaphragm **18**[2], which for example again consists of a corrugated metal disc,

is clamped in a diaphragm holding plate **23** the edge of which is clamped between the cover **1** and the spring case **2**, a packing **28** being interposed. The diaphragm holding plate **23** is provided in the middle with an opening **24** having turned up edges which receives a valve ball **25** which can be fixed to the edges of the opening **24** by soldering or in another suitable manner. The valve ball **25** normally closes the opening **29** in the metal disc **18**^{2} so that no air can pass through. One or more air holes **26** are provided in the diaphragm holding plate **23**.

The method of operation of the forms of construction according to Figs. 7 and 8 is similar to that of the constructions according to Figs. 1–6, but with the difference that the valve member **22** or **25** which closes the opening **29** is fixed and, when an under-pressure occurs in the tank, the metal disc or diaphragm **18**^{1}, **18**^{2} yields and is drawn by suction in the tank from the fixed point of the valve **22** or from the valve ball **25**. The opening **29** is thereby freed for the pressure equalization to take place.

In the forms of construction according to Figs. 1–8 the access of air can take place underneath through grooves **27** arranged on the outside of the spring case (Figs. 1, 4, 5 and 8) or from the top through one or more fine openings **11** (Figs. 1 and 6) in the cover **1**. The diaphragm itself can likewise be provided with air holes.

If an excess pressure occurs in the container, the cover **1** can be lifted from its seating against the pressure of the spring **4**. In order to protect the diaphragm against over-pressure in the tank, due to heat or the like, it is preferably fitted in a holding plate which does not allow unintended bending to take place.

The diaphragm **18**, **18**^{1}, **18**^{2} together with the valve **14**, **22**, **25** and the packing **7**, **21** are assembled in a casing to form a unit.

The nature of the diaphragm and valve construction and its arrangment may of course be different, and the remaining construction of the closure may be altered in accordance with requirements.

The new closure device can be used on all tanks and containers in which an equalization of pressure is necessary, in particular on fuel tanks, cooling water containers and so forth.

RICHARD BLAU, Jr.
WERNER BLAU.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. BLAU, JR., ET AL
CLOSURE DEVICES
Filed June 14, 1940

Serial No.
340,456
2 Sheets-Sheet 1

Fig.1.

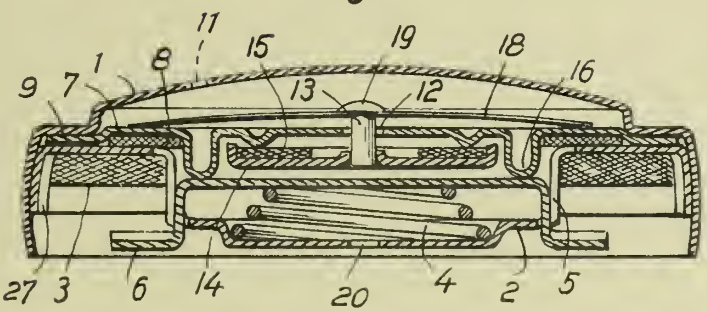


Fig.2.

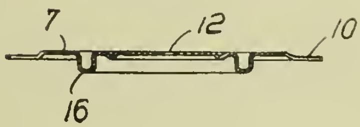


Fig.4.

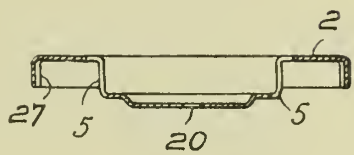


Fig.3.

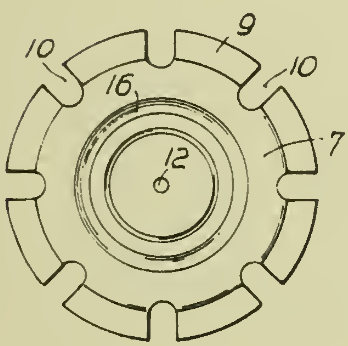
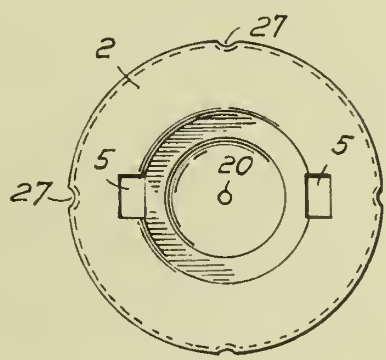


Fig.5.



Inventor:
RICHARD BLAU, JR.
WERNER BLAU
By: Richards & Geier
Attorneys:

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. BLAU, JR., ET AL
CLOSURE DEVICES
Filed June 14, 1940

Serial No.
340,456
2 Sheets-Sheet 2

Fig. 6.

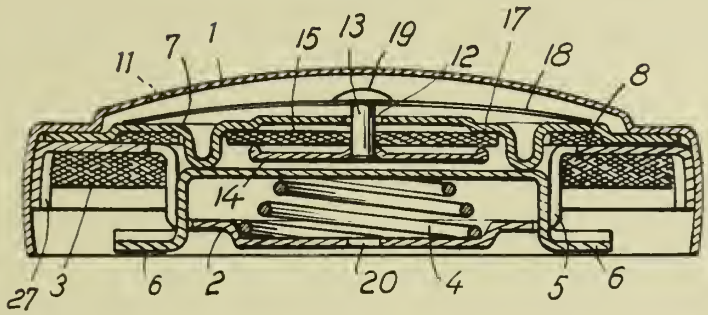


Fig. 7.

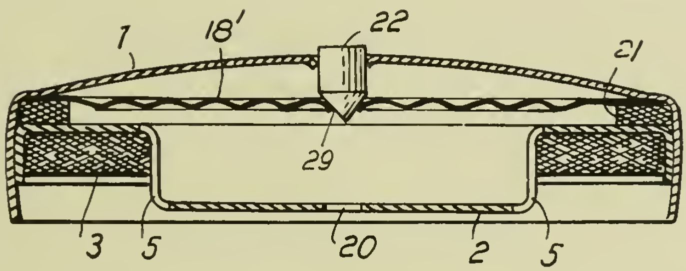
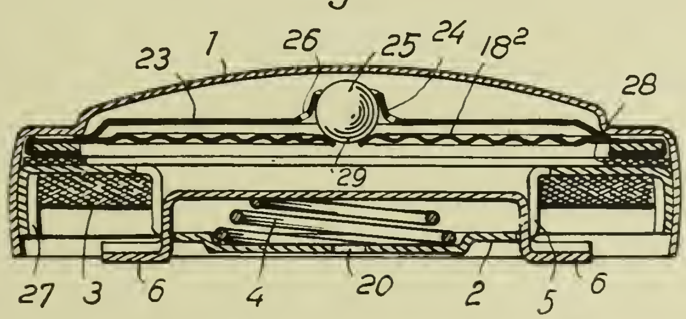


Fig. 8.



Inventor:
RICHARD BLAU, JR.
WERNER BLAU
By: Richards & Geier
Attorneys:

Published May 25, 1943

Serial No. 340,799

ALIEN PROPERTY CUSTODIAN

EXHAUST GAS PIPE FOR AIRPLANES

Alfred Hettich, Esslingen am Neckar, Germany; vested in the Alien Property Custodian

Application filed June 15, 1940

It is known to discharge the exhaust gases of engines and airplanes through nozzles whereby a thrust is exerted on the airplane so that the speed of flight will be increased. However, the entire noise of the exhaust is emitted undamped from these nozzle-shaped exhaust pipes. Furthermore, it is known to collect the exhaust elements of aero-engines in pipes, the outlet cross-section of which is greater than the total of all exhaust gas inlet cross-sections, and which have for their object to effect a suction of the exhaust gases from the cylinders and thereby to improve the output or efficiency of the engine. Guides may also be arranged in the interior of the collector for the same purpose. It is however not possible to obtain with these pipes an increase of the speed of flight by recoil.

The present invention relates to an exhaust gas pipe for airplanes, the exhaust end of which acts as recoil nozzle and is moreover designed as an output increasing collector known per se. The mouth of the recoil nozzle is arranged above the carrying plane, body or other structural parts of the airplane and the pipe is built in the airplane or cell body, wing or body so that only the outlet mouth is exposed. The exhaust gases pass from the cylinders in the usual manner through individual pipes to a common collecting pipe which is designed in a known manner so that the largest cross-section of this pipe is greater than the total of all inlet cross-sections. Separate helical guides may also be arranged in the interior of the collecting part in order to effect a suction of the exhaust gases. By this arrangement, a suction of the exhaust gases from the cylinders is effected and an improvement of the output or efficiency of the engine is thereby obtained. Heat-withdrawing structural elements for heating or the like may also be arranged in the pipe in a known manner.

At the outlet end, the exhaust gas pipe merges into a recoil nozzle of the known type which effects an increase of the speed of flight by the recoil of the exhaust gases.

The whole pipe is designed in such a manner that the mouth of the exhaust gas pipe is arranged above the carrying plane, body or above other structural parts of the airplane. Moreover, the pipe is built in the airplane or cell body, wing or body within the lining or casing so that only the outlet mouth is exposed.

The recoil nozzle, which is arranged at the end of the outlet pipe, causes an increase of the back pressure in the whole pipe, whose effect on the valves, pistons, engine output etc. in connection with the above-described arrangement is decreased or entirely suppressed by the collecting part which effects a suction of the exhaust gases. The largest cross-section of said collecting part exceeds the total of the inlet cross-sections and separate guides, which effect a suction of the exhaust gases, are built in the said collecting part. The increase of the impact or stem pressure is also simultaneously equalized which may be produced by heat withdrawing elements built in the exhaust pipe. Moreover the arrangement above the carrying plane, body or other structural parts of the airplane has also a downwardly screening and noise reducing effect. Furthermore the exhaust noise relative to exhaust members consisting only of recoil nozzles is also considerably reduced by the back pressure decreasing collecting part, which is arranged in front of the exhaust nozzle in the present case. The organic mounting of the exhaust pipe in the airplane or cell body, wing or body, whereby only the outlet mouth is exposed, also ensures an external air flow and good flying or aerodynamical qualities or characteristics.

ALFRED HETTICH.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. HETTICH

EXHAUST GAS PIPE FOR AIRPLANES

Filed June 15, 1940

Serial No.
340,799

Fig. 1.

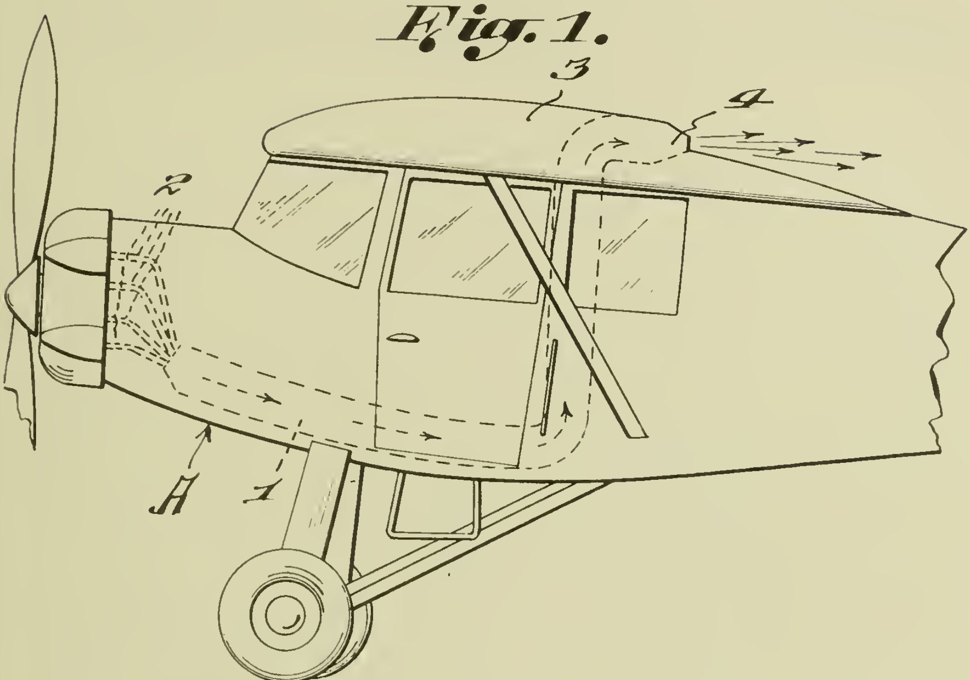


Fig. 2.

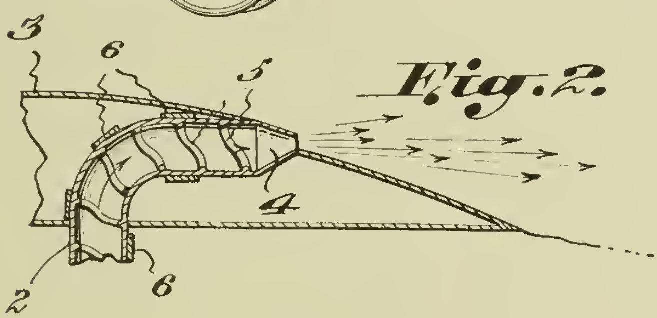
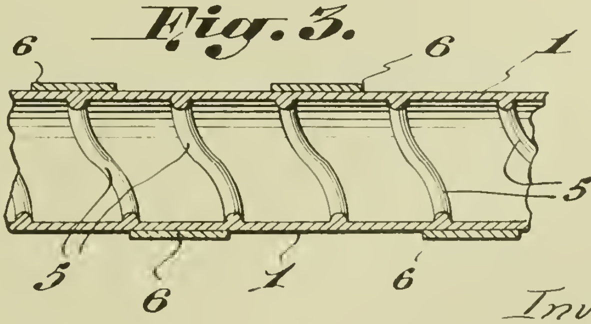


Fig. 3.



Inventor,
Alfred Hettich
By: Glascock Downing & Seebold
Attorneys.

Published May 25, 1943

Serial No. 342,188

ALIEN PROPERTY CUSTODIAN

BUSHINGS

Fritz Pesarese, Hagen, Germany; vested in the Alien Property Custodian

Application filed June 24, 1940

This invention relates to a wide-extending standard bushing for axle bearings provided with top lubrication.

Bushings for this type of lubrication are known to comprise two groups. The bushings of the first group embrace the axle journal up to the central region and possess clearances and oil grooves in their bearing face for supplying oil to the journals. Such bushings, are, however, open to the objection that their manufacture is relatively expensive, due to the necessity of providing clearances and oil grooves in their bearing face, and also to another still more serious objection, namely, that they do not insure sufficient oiling of the journals owing to the unavoidable displacement or deformation of the metal during operation, whereby the oil grooves and clearances are damaged or even closed.

The second group includes bushings which embrace the journal only at a small angle and oil is supplied to the journals from an outer limiting area of the bushings. This construction requires a small subtending angle to safely guide the lubricant to the surface of the journal and, on the other hand, fails to provide for secure guiding of the axle journal itself. Furthermore, the end face for taking up axial shocks is so small that it is subject to damage during operation.

The invention overcomes the drawbacks mentioned by causing the central portion of the bearing face of the bushing recede relative to the flanks thereof which form the contact faces for the axle journal and by providing in this central portion, outside the bearing face, passages for oil supplied to the journals by free fall, the oil flowing along the face of the passage nearest the journal and the face limiting the central portion of the bearing surface.

In further accordance with the invention, oil distribution is effected already in the grooves on the back of the bushing through passages in an overflow, and the well distributed lubricant flows along the vertical guide face of the central passage nearest the journal and onto the latter. The relative distance of the vertical guide faces of the passages is smaller than the smallest turned journal to insure positive oiling of a new journal as well as of one that has been turned down to the permissible minimum size.

The bearing face of the bushing according to the invention is therefore free from oil grooves and clearances, and the central portion thereof, or of the lining recedes relatively to the front ends of the bushing and the sides of the bearing face. In this way, large end faces are formed which are capable of taking up axial shocks and which embrace the ends wide enough to prevent the axle from rolling out. In the narrow central portion of the bearing face of the bushing oil is positively fed to the journals through slotlike passages formed in the bushing during production.

The bushing according to the invention is simple to manufacture, complies with all requirements of intensified railroad traffic and provides for liberal lubrication of the journals within range of their center, whereby thorough oiling and cooling of the sliding faces in both directions of rotation for all axle journals found in practical operation is effected.

The invention is illustrated by way of example in the accompanying drawing, in which

Figure 1 is a front view of a bushing according to the invention and a section on the line 1—1, of Fig. 2; and

Fig. 2 is a longitudinal section of a bushing according to the invention on the line 2—2, of Fig. 1.

The bushing **3** has a bearing or contact surface **4** whose central portion **5** recedes relative to the flanks **6** which with their faces **7** form also end contact members for the axle journal **8** to take up shocks occurring in axial direction. The central portion **5** of the bushing **3** is provided with slotlike passages **9** outside the bearing face **4**, and lubricant flows from a channel **10** through clearances **11** of an overflow **12** and down along the face **13**, nearest the journal **8**, of the passage **9**, passes to the face **14**, limiting the central portion **5** of the bearing face **4**, whence it drops in free fall upon the journal **8** which is thus positively lubricated.

FRITZ PESARESE.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

F. PESARESE
BUSHINGS
Filed June 24, 1940

Serial No.
342,188

Fig.1

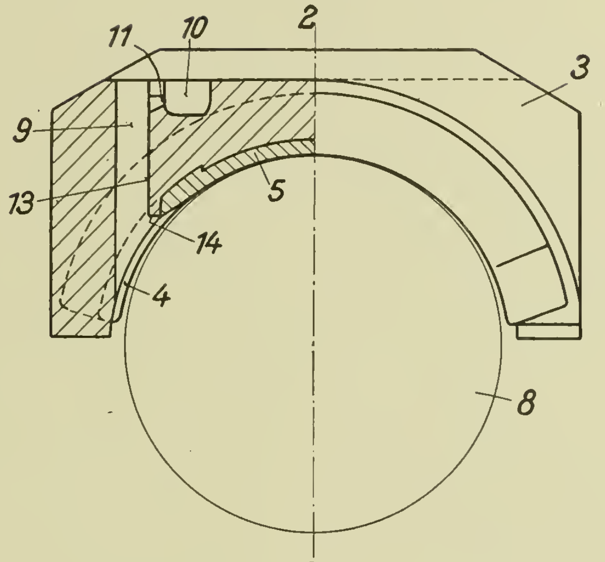
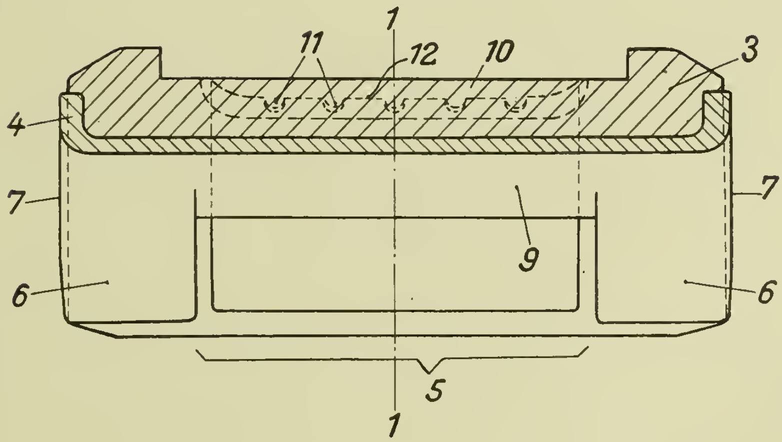


Fig.2



Inventor:
FRITZ PESARESE
By Wallenstein & Groff
Attys

Published May 25, 1943 Serial No. 342,342

ALIEN PROPERTY CUSTODIAN

AUTOMATIC CONTROL OF THE SUPPLY OF BREATHING AIR TO THE SUPER-PRESSURE CABINS IN ALTITUDE AEROPLANES

Hans Jde, Falkenberg, near Grunau, Germany; vested in the Alien Property Custodian

Application filed June 25, 1940

It is known to provide altitude aeroplanes with super-pressure cabins and supply the latter with fresh breathing air, which is under a higher pressure than that of the atmosphere. It is also known to branch off the air for the cabins from the charging air conduit of the moter and to keep constant the absolute pressure within the cabin through pressure maintaining valves which act independently of the altitude. In order to obtain also a permanent supply of air under flying conditions in which the charging pressure will drop below the pressure in the cabin (gliding, reaching the height at culmination) an additional compressor must be arranged between the conduit for the charging air and the cabin.

When employing gyroscope compressors as compressing means for the breathing air it is furthermore known to control the quantity of air through throttling at the suction side in dependency on the air pressure in the cabin. A further possibility of control now would consist in operating said compressor for the air in the cabin only upon requirement, which would make necessary the provision of various operating or controlling members respectively.

The present invention relates to a simple means of automatically bridging the various conditions of operation, through which any mechanical difficulty is avoided and no supervision is required. The additional pump, supplying the breathing air to the cabin, is constantly driven by the motor of the aeroplane.

As the motor of the aeroplane will mainly run at a constant number of revolutions, the air compressor for the cabin will induce a constant volume of air. When maintaining a constant inducing pressure and a constant inducing temperature the compressor would thus insure a constant supply of air at all altitudes of flying.

A mode of realisation of the invention is shown in the drawing by way of example and it is

Figure 1 a diagram of the arrangement for supplying air to the cabin, and

Figure 2 shows a modification thereof.

Figure 3 is another modification.

Referring to Figure 1, M represents a pressure reducing valve by which with the aid of an evacuated spring bellows *a* the inducing pressure is maintained constant at all altitudes. The air compressor V for the cabin compresses the induced air in the relation P_M:P_K and conveys the air into the pressure proof cabin K of the altitude aeroplane, just according to the selected relation of compression or admissible for the compressor, either directly or by way of an air cooling device. If the pressure reducing valve takes the breathing air from the atmosphere, the induced weight of the air at a constant number of revolutions of the compressor and at a constant inducing pressure will be determined by the temperature of the outside air.

For operative and technical reasons the supposed amount of the pressure of the air in the cabin P_K is suitably adjusted to somewhat below 1 atmosphere, for instance to 0.8 atmosphere. In that instance two unfavorable conditions of operation may occur for the compressor of the cabin air, in which the admissible relation of compression is exceeded, namely, firstly at the ground, where on the suction side the adjusted supposed value is present, while as counter-pressure the outside atmosphere will act, and secondly when flying at an altitude, where the supposed value in the cabin is maintained, while the pressure of the outside atmosphere lies below the supposed value P_M adjusted in the pressure reducing valve.

In order to be able to utilize at every altitude fully the pressure relation admissible for the compressor of the cabin air, the present invention provides for the first instance, to evacuate the spring bellows *a* only partly for the purpose of attaining by this step a sensibility of the valve to the temperature. In consequence, near the ground there will be adjusted automatically a higher inducing pressure than in the colder atmosphere in great altitudes. Through a suitable dosing of the volume of air within the spring bellows it is possible to operate the compressor at about the same relation of pressure both at altitudes and also on the ground.

In the second instance, represented in Figure 2 there is provided according to the invention still another pressure reducing valve M_2 in the inducing conduit *b* of the compressor of the cabin air, which valve will effect a connection with the pressure conduit *c* of the charging device for the motor of the aeroplane, when the adjusted inducing pressure P_M is dropping below the normal. Now the charging air is reduced to the adjusted inducing pressure P_M by means of the pressure reducing valve M_2 and the pressure reducing valve M_1 is closed by means of a nonreturn valve *d*. Through this arrangement of the said two pressure reducing valves brought to accord, an automatic reservion of the taking in of air from the atmosphere or from the conduit of the charging air is insured. In the limit case, where the pressure P_M is chosen approximately equal to the pressure on the ground, the pressure reducing

valve M_1 would be fully opened at all altitudes, so that accordingly the provision of said valve may be dispensed with and only the nonreturn valve would be present.

If it is intended to reach very great altitudes multi-stage charging devices will be used and accordingly a plurality of pressure reducing valves may be provided which are brought in accord in such a manner, that each time the correct pressure stage of the charging aggregate is tapped for the supply of the breathing air. In Figure 3, for instance, there are provided two charging stages L_1 and L_2 with their air coolers K_1 and K_2, which will supply the charging air for the motor of the aeroplane. The air is induced at *e* from the free atmosphere and conveyed into the motor at *f*. In the exhaust conduit of the compressor V for the cabin air are provided pressure reducing valves M_3, M_4, M_5 which just according to the altitude attained will reduce the breathing air from the free atmosphere to the adjusted inducing pressure, according to the first charging stage or according to the second charging stage.

HANS JDE.

PUBLISHED

MAY 25, 1943.

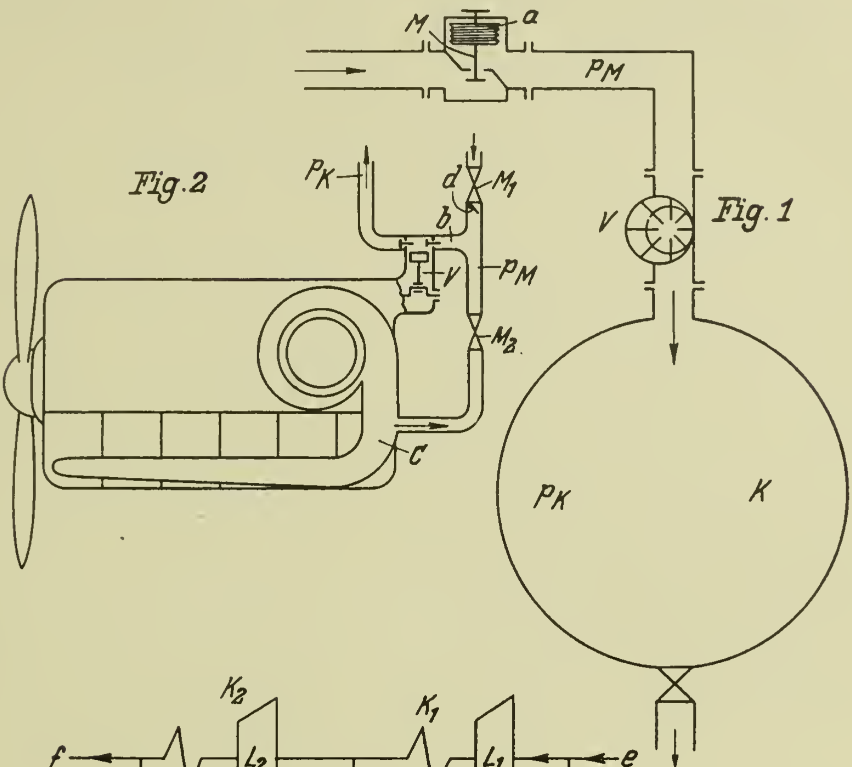
BY A. P. C.

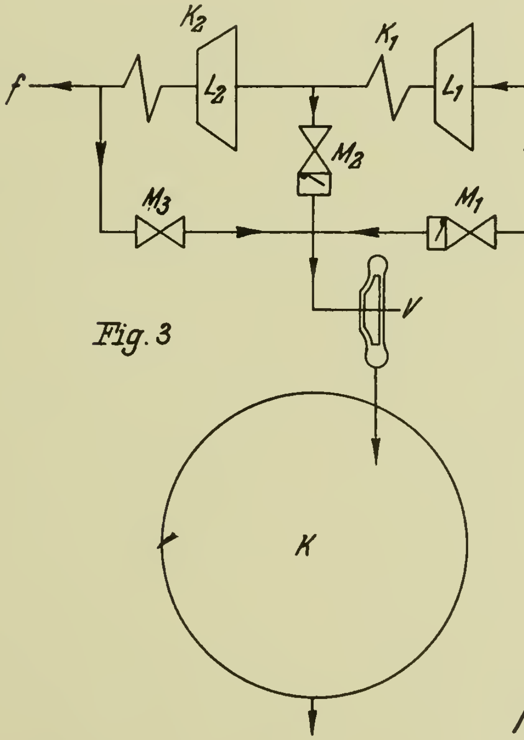
H. JDE

AUTOMATIC CONTROL OF THE SUPPLY OF BREATHING AIR TO THE SUPER-PRESSURE CABINS IN ALTITUDE AREOPLANES

Filed June 25, 1940

Serial No. 342,342





Inventor:

HANS JDE

BY HIS ATTORNEYS

Howson and Howson

Published May 25, 1943 Serial No. 342,342

ALIEN PROPERTY CUSTODIAN

AUTOMATIC CONTROL OF THE SUPPLY OF BREATHING AIR TO THE SUPER-PRESSURE CABINS IN ALTITUDE AEROPLANES

Hans Jde, Falkenberg, near Grunau, Germany; vested in the Alien Property Custodian

Application filed June 25, 1940

It is known to provide altitude aeroplanes with super-pressure cabins and supply the latter with fresh breathing air, which is under a higher pressure than that of the atmosphere. It is also known to branch off the air for the cabins from the charging air conduit of the motor and to keep constant the absolute pressure within the cabin through pressure maintaining valves which act independently of the altitude. In order to obtain also a permanent supply of air under flying conditions in which the charging pressure will drop below the pressure in the cabin (gliding, reaching the height at culmination) an additional compressor must be arranged between the conduit for the charging air and the cabin.

When employing gyroscope compressors as compressing means for the breathing air it is furthermore known to control the quantity of air through throttling at the suction side in dependency on the air pressure in the cabin. A further possibility of control now would consist in operating said compressor for the air in the cabin only upon requirement, which would make necessary the provision of various operating or controlling members respectively.

The present invention relates to a simple means of automatically bridging the various conditions of operation, through which any mechanical difficulty is avoided and no supervision is required. The additional pump, supplying the breathing air to the cabin, is constantly driven by the motor of the aeroplane.

As the motor of the aeroplane will mainly run at a constant number of revolutions, the air compressor for the cabin will induce a constant volume of air. When maintaining a constant inducing pressure and a constant inducing temperature the compressor would thus insure a constant supply of air at all altitudes of flying.

A mode of realisation of the invention is shown in the drawing by way of example and it is

Figure 1 a diagram of the arrangement for supplying air to the cabin, and

Figure 2 shows a modification thereof.

Figure 3 is another modification.

Referring to Figure 1, M represents a pressure reducing valve by which with the aid of an evacuated spring bellows *a* the inducing pressure is maintained constant at all altitudes. The air compressor V for the cabin compresses the induced air in the relation $P_M:P_K$ and conveys the air into the pressure proof cabin K of the altitude aeroplane, just according to the selected relation of compression or admissible for the compressor, either directly or by way of an air cooling device. If the pressure reducing valve takes the breathing air from the atmosphere, the induced weight of the air at a constant number of revolutions of the compressor and at a constant inducing pressure will be determined by the temperature of the outside air.

For operative and technical reasons the supposed amount of the pressure of the air in the cabin P_K is suitably adjusted to somewhat below 1 atmosphere, for instance to 0.8 atmosphere. In that instance two unfavorable conditions of operation may occur for the compressor of the cabin air, in which the admissible relation of compression is exceeded, namely, firstly at the ground, where on the suction side the adjusted supposed value is present, while as counter-pressure the outside atmosphere will act, and secondly when flying at an altitude, where the supposed value in the cabin is maintained, while the pressure of the outside atmosphere lies below the supposed value P_M adjusted in the pressure reducing valve.

In order to be able to utilize at every altitude fully the pressure relation admissible for the compressor of the cabin air, the present invention provides for the first instance, to evacuate the spring bellows *a* only partly for the purpose of attaining by this step a sensibility of the valve to the temperature. In consequence, near the ground there will be adjusted automatically a higher inducing pressure than in the colder atmosphere in great altitudes. Through a suitable dosing of the volume of air within the spring bellows it is possible to operate the compressor at about the same relation of pressure both at altitudes and also on the ground.

In the second instance, represented in Figure 2 there is provided according to the invention still another pressure reducing valve M_2 in the inducing conduit *b* of the compressor of the cabin air, which valve will effect a connection with the pressure conduit *c* of the charging device for the motor of the aeroplane, when the adjusted inducing pressure P_M is dropping below the normal. Now the charging air is reduced to the adjusted inducing pressure P_M by means of the pressure reducing valve M_2 and the pressure reducing valve M_1 is closed by means of a nonreturn valve *d*. Through this arrangement of the said two pressure reducing valves brought to accord, an automatic reservion of the taking in of air from the atmosphere or from the conduit of the charging air is insured. In the limit case, where the pressure P_M is chosen approximately equal to the pressure on the ground, the pressure reducing

valve M_1 would be fully opened at all altitudes, so that accordingly the provision of said valve may be dispensed with and only the nonreturn valve would be present.

If it is intended to reach very great altitudes multi-stage charging devices will be used and accordingly a plurality of pressure reducing valves may be provided which are brought in accord in such a manner, that each time the correct pressure stage of the charging aggregate is tapped for the supply of the breathing air. In Figure 3, for instance, there are provided two charging stages L_1 and L_2 with their air coolers K_1 and K_2, which will supply the charging air for the motor of the aeroplane. The air is induced at *e* from the free atmosphere and conveyed into the motor at *f*. In the exhaust conduit of the compressor V for the cabin air are provided pressure reducing valves M_3, M_4, M_5 which just according to the altitude attained will reduce the breathing air from the free atmosphere to the adjusted inducing pressure, according to the first charging stage or according to the second charging stage.

HANS JDE.

PUBLISHED

MAY 25, 1943.

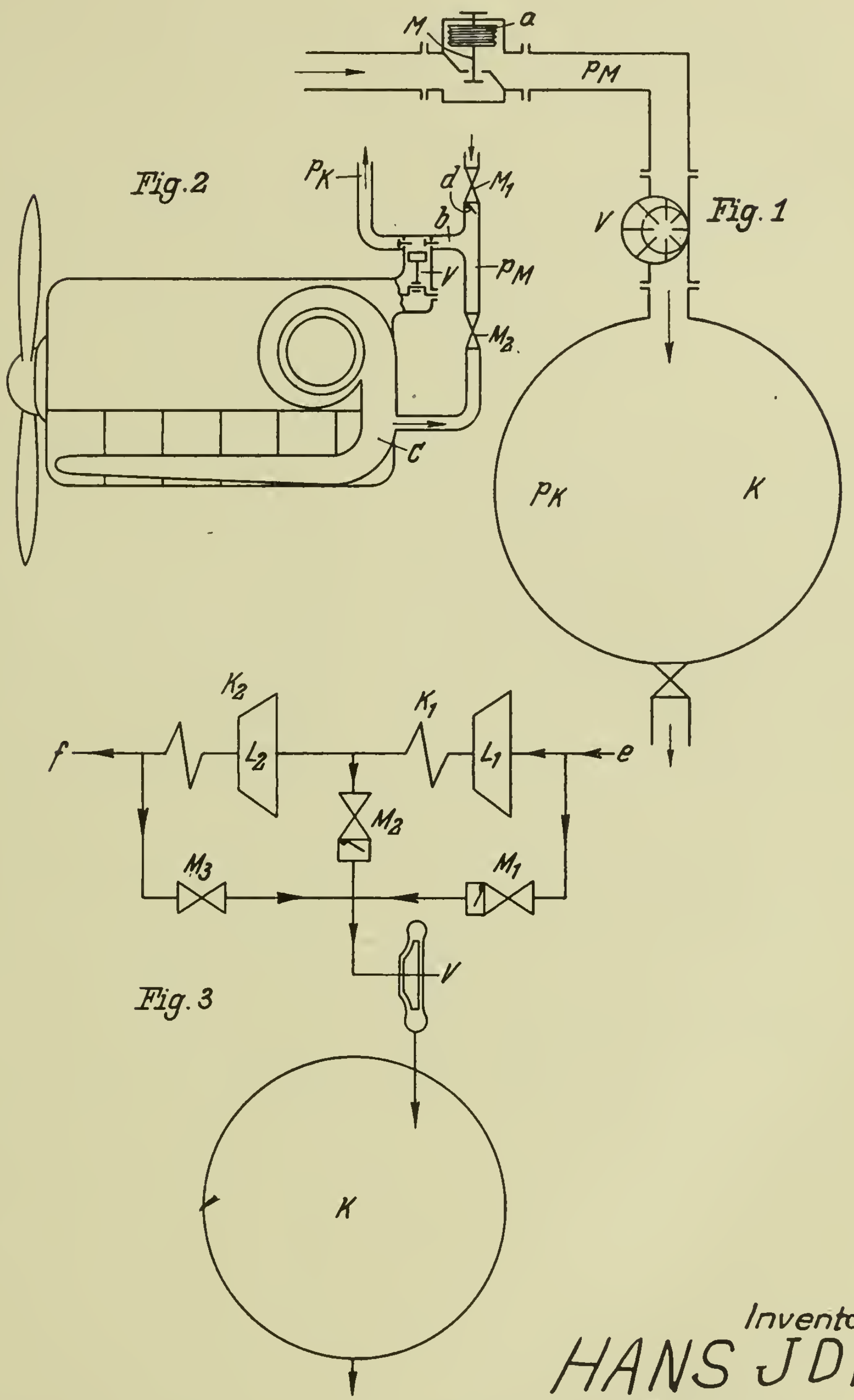
BY A. P. C.

H. JDE

AUTOMATIC CONTROL OF THE SUPPLY OF BREATHING AIR TO THE SUPER-PRESSURE CABINS IN ALTITUDE AREOPLANES

Filed June 25, 1940

Serial No. 342,342



Inventor:
HANS JDE
BY HIS ATTORNEYS
Howson and Howson

Published May 25, 1943 Serial No. 342,564

ALIEN PROPERTY CUSTODIAN

BAR SOAP COMPOSITION

Ferdinand Bornemann and Hans Huber, Wiesbaden-Biebrich, Germany; vested in the Alien Property Custodian

No Drawing. Application filed June 26, 1940

This invention relates to an improved bar soap composition and more particularly to such a composition consisting essentially of a sodium soap and a small proportion of an alkali metal polyphosphate.

The use of alkali metal pyro and meta-phosphates as anti-precipitating agents in hard water is now well known. Furthermore, these materials have been suggested for use in combination with soap as soap-improving ingredients in powdered and liquid soap mixtures. They have not been satisfactory for use in solid bar soap because the pyrophosphates tend to crystallize and produce a soap of frosty appearance which is unsightly and unsalable. The meta-phosphates are not stable in the presence of the amount of moisture required in a bar soap.

The use of molecularly dehydrated phosphates has also been suggested in powdered aluminum soap mixtures in combination with oxygen yielding materials, but the function of the soap in such instances is not that of a detergent. It serves, on the contrary, to delay or inhibit the reaction of the oxygen yielding materials when placed in water.

In accordance with the present invention, a bar soap is produced by intimately admixing with a suitably moist sodium soap a small proportion, preferably not less than 15%, of an alkali metal tri-polyphosphate.

The preferred polyphosphate is sodium tri-polyphosphate ($Na_5P_3O_{10}$). It is stable in moist bar soaps and does not produce an undesirable appearance on the passage of time. It greatly improves the emulsifying power of the soap in hard water, yields a rich creamy lather, and modifies the alkaline reaction of the soap so that it will not irritate the skin.

As an example of the soap composition, 100 kilograms of a solid laundry soap having a 75% fatty acid content was mixed with 6 kilograms of sodium tri-polyphosphate and 14 kilograms of water. The mixture was then milled to a homogeneous mass, shaped, and permitted to set up into a hard solid mass. After three years 85% of the phosphate was still in the form of the original tri-polyphosphate.

The amount of sodium tri-polyphosphate may be varied over a wide range, but in general it is preferred to employ from 5% to 15% based upon the total weight of the soap bar. Amounts from 1% to 5%, however, are quite satisfactory for use in most types of water, and particularly the softer waters.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom for some modifications will be obvious to those skilled in the art.

FERDINAND BORNEMANN.
HANS HUBER.

[illegible]

Published May 25, 1943

Serial No. 342,615

ALIEN PROPERTY CUSTODIAN

RADIO TUNING UNITS

Fritz Bergtold, Kiel, Germany; vested in the Alien Property Custodian

Application filed June 27, 1940

The invention relates to radio receivers such as push-button receivers having a series of tuning units consisting of a fixedly set condenser and a coil. In such receivers the units are so arranged as to be moved longitudinally to bring one of the units into its active position in which the receiver is tuned on the predetermined wavelength assigned to said unit. Heretofore it has been necessary to adjust the units mounted in the radio receiver after the latter has been connected to an antenna and being placed on the plot where it shall be used. For the purpose of fine adjustment the known receivers of said kind had partly to be demounted. To avoid this disadvantage the invention provides a tuning unit being composed of a coil and a fixedly set condenser which is constructed in such a way as to allow a fine adjustment without demountage. The new unit, therefore, is so constructed as to be allowed to be placed in every receiver and to be finely adjusted after being attached to the receiver. To this purpose the coil of the unit can be adjusted by moving its iron core into or out of same after having released the front part of the new unit to allow a screw spindle to be rotated to which the core is attached. The unit, therefore, is provided with a removable cap serving as push-button and sealing the adjusting means co-operating with the screw spindle. In assembling the receiver casing is provided with corresponding bearings into which the units are set in. The units can easily be removed from the receiver and other ones acting on other predetermined wavelengths can be inserted. Thus it is possible to have a series of units which at will may be inserted into the receiver.

In the accompanying drawing one form of execution of the invention is represented by way of example.

In the receiver only shown by its frontwall *q* and an intermediate wall o a cylindrical sleeve *a* is arranged having an extension *n* on the rear end which is smaller in diameter than the diameter of the sleeve *a*. The extension *n* is provided with a flange *n'* protruding through wall o of the receiver casing and being in connection with a known locking device, not shown. The latter serves for the purpose to lock the sleeve in its positions. A spring *p* coiled around the prolongation *n* is disposed to hold the sleeve *a* in its inactive position in which no electrical connections exist between contacts *d* of the sleeve and contacts *e* arranged in the receiver and adapted to co-operate with said contacts *d* arranged on the sleeve *a* manufactured of insulating material. The front end of the sleeve *a* is carried in a ring *r* having a reduced part screwed into a corresponding hole of the frontwall *q*. To the inner surface of the ring *r* is fastened a flange *u* provided with a screw-thread and connected with the bottom *s* of the sleeve *a*. In the centre of said bottom an enlargement *t* is provided having a screw-threaded hole for the insertion of a spindle. A cap *v* can be screwed into the flange *u*.

In the sleeve *a* is mounted a cylinder *b* adapted to carry coils *c* arranged on the outer surface of the cylinder *b*. The coils are in connection with said contacts *d* disposed on the outer surface of the sleeve *a*. The cylinder *b* is divided by the intermediary of a partition wall *k* into two parts in each of which an iron core *h* as well as a fixedly set condenser *m* are situated. The cores are carried on a screw-threaded spindle *g* which is arranged in the center of the cylinder *b* and can be moved longitudinally by being rotated in the nut or enlargement *t* of the bottom *s*. The condensers *m* are carried by the partition wall *k* and by the bottom *s*, respectively. The said condensers *m* are in electrically connections with the coils *c*. The spindle *g* guided in the enlargement *t* of the bottom *s* can be fixed in any position desired by means of a nut *i*. The contacts *e* and *d* are arranged in such a way as to be held out of contact by the action of the spring *p*. To make contact the sleeve *a* must be pushed in by pressing the cap *v* screwed into the flange *u* in order to allow an adjustment of the high-frequency iron cores *h* after having been inserted into the receiver. As aforesaid the sleeve is locked in its active position in which the contacts *d* and *e* are connected and the coils *c* are switched in. As is known the locked position of the sleeve is released when a second sleeve mounted to the receiver is depressed.

The sleeve *a* together with its inner parts serves as a tuning unit and will be tuned on a predetermined wavelength before being inserted into the receiver. The receiver casing is provided with a series of corresponding units each tuned on an individual length desired. The sleeves are fastened in the casing by screwing the ring *r* into the frontwall *g*. After having pushed in the sleeve whereby the contacts *d* and *e* are connected and the coils and condensers are switched in the cap *v* will be removed as to give free admittance to the nut *i* and spindle *g*. By rotating same a fine tuning of the device may be obtained by adjusting the iron cores *h* in the coils *c*. After the fine adjustment the spindle *g* is locked by means of the nut *i* and the cap *v* is replaced.

FRITZ BERGTOLD.

PUBLISHED

MAY 25, 1943.

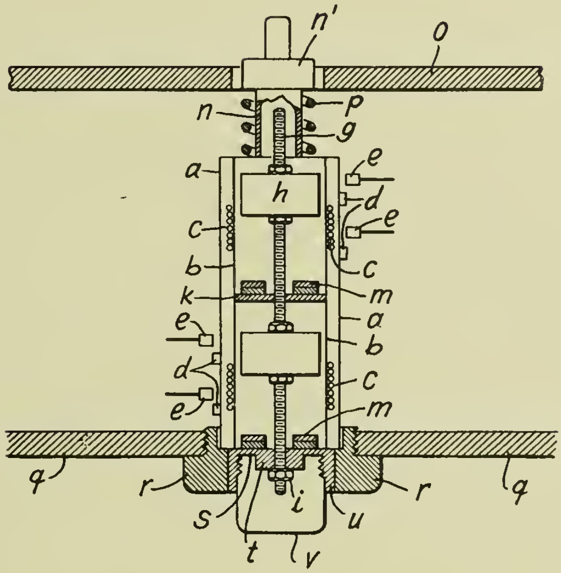
BY A. P. C.

F. BERGTOLD

RADIO TUNING UNITS

Filed June 27, 1940

Serial No.
342,615



INVENTOR
Fritz Bergtold
BY H. S. Grover
ATTORNEY

Published May 25, 1943

Serial No. 342,756

ALIEN PROPERTY CUSTODIAN

AIRPLANE LANDING GEAR

Jean Mercier, Neuilly-sur-Seine, France; vested in the Alien Property Custodian

Application filed June 27, 1940

The present invention relates to landing gear used on aircraft.

Landing gears are known in which each wheel is mounted on a single strut which is formed by a closed cylinder and a piston. The cylinder, and also in some cases the piston, contains oil or another appropriate liquid, and means are provided for choking its circulation, so that the relative movement of the cylinder and piston is suitably damped. A landing gear of this type is described in my copending application Serial No. 176,693, filed December 8, 1937.

Usually, the resilient force required to support the weight of the aeroplane is supplied by the cushion of compressed air provided above the liquid. In devices of this type, in which the work chamber formed in the cylinder is of variable volume, as is the case in the landing gear described in my aforesaid copending application, it is obviously necessary for a certain volume of compressible fluid to be provided in said chamber, contrary to what takes place in shock-absorbers which cause the liquid to circulate in a chamber of constant total volume, usually, said compressible fluid, such as air, is given such a pressure that it is capable of supporting the weight of the aeroplane and thus forms the resilient suspension means for the wheel. However, owing to the high pressure in the work chamber, the liquid and sometimes the air, gradually escapes by leaking between the contacting surfaces of the cylinder and piston.

In order to prevent the wheel from swinging or from being unduly turned owing to the relative pivoting of the piston and cylinder, which are usually of round cross-section, various means are provided, such as conventional guiding means, on the cylinder and the piston, which enable them to slide but prevent them from rotating relatively to each other.

The object of the present invention is to provide simple means for preventing the wheel from swinging, to provide a resilient suspension force, thereby to reduce the pressure of the compressed fluid in the work chamber and eliminate the sliding friction of the conventional guiding means.

Another object of the invention is to provide a fluid-tight closure for the cylinder behind the piston.

The invention will now be described with reference to the accompanying drawing in which:

Fig. 1 is a side view of a landing gear according to the invention, with certain parts shown diagrammatically and certain parts having portions broken away so as to show the construction better.

Fig. 2 is a partial side view of another landing gear incorporating the invention.

Referring to Fig. 1, the landing gear shown comprises a strut formed by a cylinder 1 and a piston 2 with its rod 2^a. A work chamber 3 is formed between the end 1^a of the cylinder and the piston 2. Said chamber contains the liquid which the reciprocation of the piston forces through suitable passages, not shown, so that the cylinder and piston unit essentially forms a shock-absorber. The cylinder 1 is fixed to the body of the aeroplane 4 (the expression "body" should be understood as also including the wings or any other part rigidly fixed to the body proper), and the piston 2 to the mounting, such as the fork 5 of the wheel 6. It is however obvious that the reverse arrangement could be employed.

According to the invention, the cylinder is connected to the piston by a member which is resiliently deformable in the direction of reciprocation of the piston in the cylinder, but substantially rigid with respect to torsional stresses. Said member is formed, in the device shown in Fig. 1, by a bulge 7, made of rubber containing diagonally crossed reinforcing threads as shown at 7^a. Said bulge has two necks 7^b, one of which is fixed by vulcanization to the open end of the cylinder 1, and the other to the piston, viz. to a circle 8 fixed to the wheel mounting 5 at the foot of the piston rod 2^a. The joints of the bulge 7 are reinforced by means of collars 9, to which the necks 7^b are also preferably fixed by vulcanization.

Owing to the fluid-tight fixing of the bulge 7, a closed chamber 10 is formed in said bulge and the cylinder 1 behind the piston 2. Since the bulge is of much larger cross-section than the annular cross-section of the cylinder behind the piston the volume of the chamber 10 decreases when the piston moves into the cylinder, and the air or other gas which is contained therein is compressed. By filling the chamber 10 at a suitable pressure, it is possible to arrange for a desired portion of the weight of the aeroplane to be supported by the pressure of the compressed air in the chamber, by correspondingly reducing the pressure of the compressed air in the chamber 3. If desired, the pressures in the chambers 3 and 10 may be made nearly equal, thereby substantially eliminating leaks of liquid from the chamber 3. In any case, there can only be leaks between the chamber 3 and the chamber 10, and not between the chamber 3 and the outside,

while any pressure created in the chamber 10 acts as a back-pressure and reduces the leaks from the chamber 3.

It will be seen that the wheel is prevented from swinging by the rigidity of the bulge 7 with respect to torsional stresses, whereas any other guiding means which produce sliding friction or require more complicated devices are eliminated. It is however possible to provide devices which more or less relieve the bulge 7 or other like connecting means according to the invention, such for example as the additional strut 22, 24 shown in my aforesaid copending application.

Another device which enables this latter result to be obtained and can also be made to bear a more or less large portion of the weight and to reduce the pressure in the chamber 3 in the case in which the landing gear is of the compressible fluid chamber type, although it does not give a fluid-tight effect, is shown in Fig. 2. The connecting means is in this case formed by a spring 11 of the elliptic leaf type which is well known in horse-drawn vehicles. One of the buckles 12 of this spring is fixed to the cylinder 1, and the other to the piston, viz. in the case illustrated, to its rod 2ª or to the fork 5. For the sake of symmetry, like spring may be provided on the other side of the cylinder 1, or again a single spring may be mounted in an axial plane of the cylinder, as is obvious to any person skilled in the art. It is also obvious that, whereas a spring generally arranged in the plane of the wheel has been shown, it may also be arranged transversely, as is also known in the construction of vehicles, or at any desired angle.

JEAN MERCIER.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

J. MERCIER
AIRPLANE LANDING GEAR
Filed June 27, 1940

Serial No.
342,756

Fig. 1.

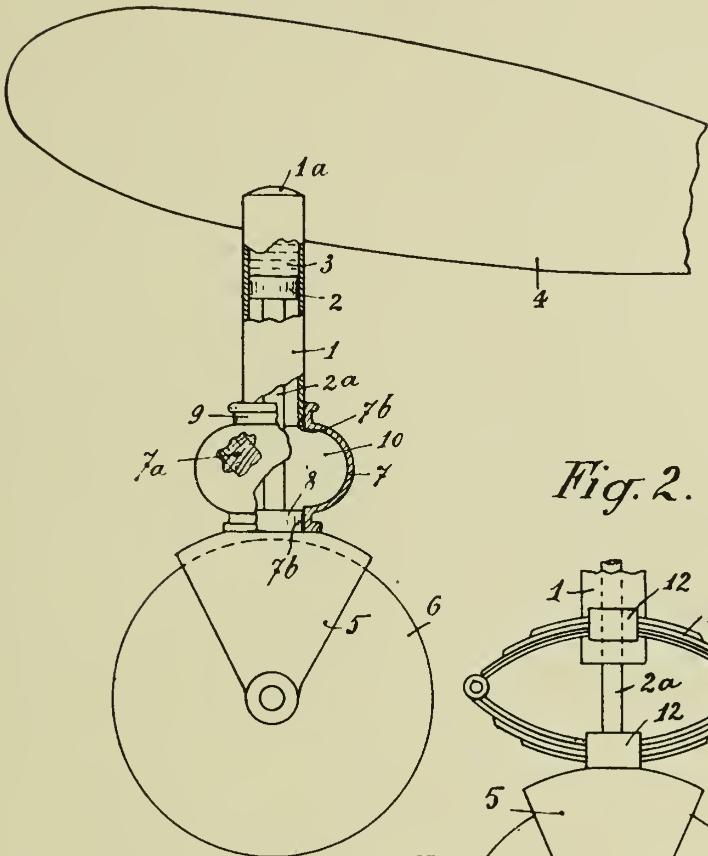
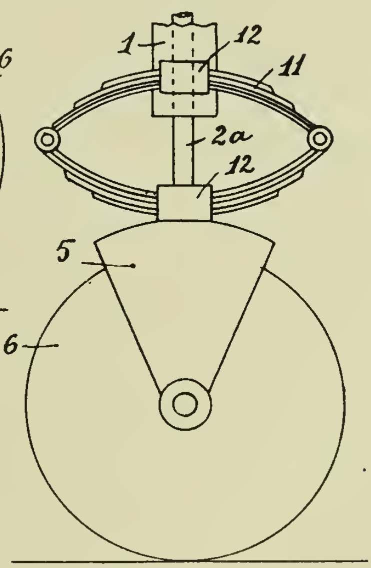


Fig. 2.



Jean Mercier
INVENTOR
By Otto Munk
his ATT'Y.

Published May 25, 1943 Serial No. 343,131

ALIEN PROPERTY CUSTODIAN

DEVICE FOR RESETTING OR CORRECTING KEY TUNING DEVICES

Alfred Schöne, Berlin-Tempelhof, Germany; vested in the Alien Property Custodian

Application filed June 29, 1940

The invention relates to a device for resetting or correcting key tuning devices of radio sets or the like.

In radio receiving sets and similar sets for the reception of intelligence provided with key tuning devices it is desirable in many cases to allot at will each key to a given frequency. Even if it is not possible to select any transmitting station for each key, still it is necessary in most cases to correct from time to time the adjusted tuning value of the individual keys. Owing to the differences in temperature, shocks and to the mechanical deformations of the elements determining the frequency, which deformations occur with time, it often happens that the value adjusted is not accurate.

While in such key tuning devices in which the keys act mechanically on the tuning elements or in which, for instance, a variable condenser is adjusted it is possible to easily provide the key in most cases with a shifting device, difficulties are encountered in press-button sets which, for instance, operate with a device for varying the permeability. If, for instance, a tuning is so effected that for every key separate oscillation circuits are employed, separate devices must be provided in order to enable a readjustment of each of the oscillation circuits as may be required. In this case the adjustment is effected in most cases by varying the capacity of trimmer condensers or by adjusting the high-frequency iron cores of the oscillating coils. This may be accomplished in such a manner that when reselecting a station which is to be later readjusted by means of a key, the adjustable high-frequency iron cores are brought with the aid of a screw driver into the proper position on one spindle carrying the high-frequency iron core. For this purpose it is necessary either to provide a gap for the spindles which extend to the iron core so that the adjustment may later be effected with the aid of the screw driver or to provide a cover for this gap which is removably mounted for the readjustment. The employment of a tool presents, however, a great disadvantage to such an adjusting device as compared to the systems in which the readjustment of the transmitting station may be effected with the aid of press-buttons.

This drawback may be removed by the device according to the invention in which the keys are so rotatably mounted and so designed to move in a direction opposite to the direction of actuation that by moving the key in a direction opposite to the direction of actuation a friction wheel, gear or the like firmly secured to the keys comes into engagement with such movable elements which upon the rotation of the key are rotated by the friction wheel, gear or the like and which effect a change in tuning. The keys may preferably be designed in the form of axially shiftable press buttons which are capable of being pulled out for readjusting the tuning elements and which are held in their position of rest by means of a spring.

The readjustment of the tuning members may be effected by the adjustment of condensers. In this case the condensers may be amply dimensioned depending upon whether a readjustment is desired throughout a wide range. However, if only a small readjustment is required also small trimmer condensers may be employed. The adjustment may be effected with the aid of adjustable iron cores of coils determining the frequency, in which case the iron cores may be provided with a screw thread so that they may be screwed into the coils to a more or less extent or it is also possible to shift the iron cores into the coils. If a simultaneous adjustment of various tuning circuits is necessary the iron cores of the individual coils may easily be coupled in such a manner with one another that they may be adjusted simultaneously.

In the accompanying drawing is shown an embodiment of the invention in diagrammatic form.

1 denotes the key which is firmly secured to a rod 2 capable of being shifted in the axial direction. At the opposite end of the rod 2 switches (not shown) may be arranged. On the rod is firmly mounted a friction wheel, gear or the like 3.

In the embodiment shown two tuning circuits are to be varied. In this case the adjustment is effected by the two iron cores 4 and 5 coupled with one another and which may be adjusted by helically moving them in the coils 6 and 7. The iron cores are therefore associated with a spindle 8 carrying a gear or friction wheel 9. By pulling out the key 1 the gear 3 may be brought into engagement with the gear 9. If the key 1 is rotated about the axis of the rod 2 the gear 9 is also rotated, thereby effecting the adjustment of the two iron cores which move, for instance, in a cardboard thread. By suitably selecting the ratio of transmission of the gears 3 and 9 any fine adjustment may be effected. The spring 10 serves to keep the two gears 3 and 9 out of engagement when the push button is in the position of rest. The adjustment of the desired station is effected in the usual manner by pressing the corresponding press button.

ALFRED SCHÖNE.

Published May 25, 1943 Serial No. 343,131

ALIEN PROPERTY CUSTODIAN

DEVICE FOR RESETTING OR CORRECTING KEY TUNING DEVICES

Alfred Schöne, Berlin-Tempelhof, Germany; vested in the Alien Property Custodian

Application filed June 29, 1940

The invention relates to a device for resetting or correcting key tuning devices of radio sets or the like.

In radio receiving sets and similar sets for the reception of intelligence provided with key tuning devices it is desirable in many cases to allot at will each key to a given frequency. Even if it is not possible to select any transmitting station for each key, still it is necessary in most cases to correct from time to time the adjusted tuning value of the individual keys. Owing to the differences in temperature, shocks and to the mechanical deformations of the elements determining the frequency, which deformations occur with time, it often happens that the value adjusted is not accurate.

While in such key tuning devices in which the keys act mechanically on the tuning elements or in which, for instance, a variable condenser is adjusted it is possible to easily provide the key in most cases with a shifting device, difficulties are encountered in press-button sets which, for instance, operate with a device for varying the permeability. If, for instance, a tuning is so effected that for every key separate oscillation circuits are employed, separate devices must be provided in order to enable a readjustment of each of the oscillation circuits as may be required. In this case the adjustment is effected in most cases by varying the capacity of trimmer condensers or by adjusting the high-frequency iron cores of the oscillating coils. This may be accomplished in such a manner that when reselecting a station which is to be later readjusted by means of a key, the adjustable high-frequency iron cores are brought with the aid of a screw driver into the proper position on one spindle carrying the high-frequency iron core. For this purpose it is necessary either to provide a gap for the spindles which extend to the iron core so that the adjustment may later be effected with the aid of the screw driver or to provide a cover for this gap which is removably mounted for the readjustment. The employment of a tool presents, however, a great disadvantage to such an adjusting device as compared to the systems in which the readjustment of the transmitting station may be effected with the aid of press-buttons.

This drawback may be removed by the device according to the invention in which the keys are so rotatably mounted and so designed to move in a direction opposite to the direction of actuation that by moving the key in a direction opposite to the direction of actuation a friction wheel, gear or the like firmly secured to the keys comes into engagement with such movable elements which upon the rotation of the key are rotated by the friction wheel, gear or the like and which effect a change in tuning. The keys may preferably be designed in the form of axially shiftable press buttons which are capable of being pulled out for readjusting the tuning elements and which are held in their position of rest by means of a spring.

The readjustment of the tuning members may be effected by the adjustment of condensers. In this case the condensers may be amply dimensioned depending upon whether a readjustment is desired throughout a wide range. However, if only a small readjustment is required also small trimmer condensers may be employed. The adjustment may be effected with the aid of adjustable iron cores of coils determining the frequency, in which case the iron cores may be provided with a screw thread so that they may be screwed into the coils to a more or less extent or it is also possible to shift the iron cores into the coils. If a simultaneous adjustment of various tuning circuits is necessary the iron cores of the individual coils may easily be coupled in such a manner with one another that they may be adjusted simultaneously.

In the accompanying drawing is shown an embodiment of the invention in diagrammatic form.

1 denotes the key which is firmly secured to a rod **2** capable of being shifted in the axial direction. At the opposite end of the rod **2** switches (not shown) may be arranged. On the rod is firmly mounted a friction wheel, gear or the like **3**.

In the embodiment shown two tuning circuits are to be varied. In this case the adjustment is effected by the two iron cores **4** and **5** coupled with one another and which may be adjusted by helically moving them in the coils **6** and **7**. The iron cores are therefore associated with a spindle **8** carrying a gear or friction wheel **9**. By pulling out the key **1** the gear **3** may be brought into engagement with the gear **9**. If the key **1** is rotated about the axis of the rod **2** the gear **9** is also rotated, thereby effecting the adjustment of the two iron cores which move, for instance, in a cardboard thread. By suitably selecting the ratio of transmission of the gears **3** and **9** any fine adjustment may be effected. The spring **10** serves to keep the two gears **3** and **9** out of engagement when the push button is in the position of rest. The adjustment of the desired station is effected in the usual manner by pressing the corresponding press button.

ALFRED SCHÖNE.

PUBLISHED

MAY 25, 1943.

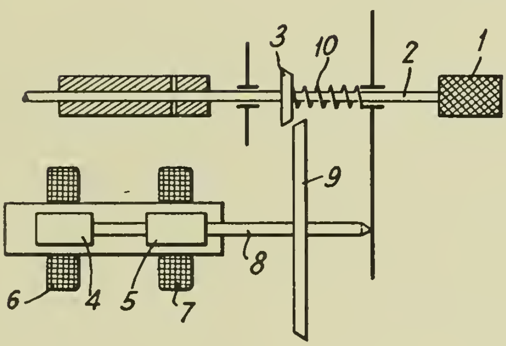
BY A. P. C.

A. SCHÖNE

DEVICE FOR RESETTING OR CORRECTING KEY TUNING DEVICES

Filed June 29, 1940

Serial No. 343,131



INVENTOR

ALFRED SCHONE

BY H. S. Grover

ATTORNEY

Published May 25, 1943 Serial No. 343,887

ALIEN PROPERTY CUSTODIAN

MIXING MACHINE

Joseph Eirich, Hardheim/Nordbaden, Germany; vested in the Alien Property Custodian

Application filed July 3, 1940

The present invention relates to improvements in mixing apparatus for mixing viscous or plastic substances or materials becoming viscous or plastic during the mixing operation.

Hereinafter in the specification and claims the term "plastic substances" will be employed to cover viscous or plastic substances or materials becoming viscous or plastic during the mixing operation.

The present application is a continuation-in-part application of application S. N. 213,906, filed June 15, 1938, which is a continuation-in-part of application S. N. 35,394, filed August 8, 1935.

It is an object of the present invention to provide an apparatus which will thoroughly mix plastic substances with a minimum expenditure of energy in as short a time as possible.

Other objects of the present invention will become apparent from the following specification and claims:

The preparation of mixtures from plastic substances is very difficult because the high cohesion of such substances impedes the admixture of other materials. Previously, it was found necessary to employ apparatus essentially having a kneading action in order to effect mixtures of plastic substances. This type of apparatus possesses the disadvantages that it is difficult to control and that it requires relatively high power requirements.

It has now been unexpectedly found that even tenacious plastic substances can easily and rapidly be mixed to produce homogeneous mixtures with the aid of rapidly rotating knife-like rods which are arranged to produce a rake-like action upon the material to be mixed with only a relatively low power requirement. These rotating rods are arranged so that they substantially come in contact with the surface supporting the material to be mixed, such as the horizontal surface of a mixing bowl, and so that they describe a planetary movement with respect to such surface. The rods thereby describe paths which repeatedly cross over each other and effectively cut the material into narrow strips or bands in constantly varying directions.

In accordance with the present invention the mixing apparatus comprises a mixing bowl having a substantially flat, circular, horizontal mixing plate, and a plurality of rods adapted and arranged to have a knife-like action, which rods rotate about a vertical axis eccentric to the mixing plate and are spaced at varying distances from such eccentric axis so as to provide a rake-like action. The mixing apparatus is furthermore adapted and arranged so that the rods rotating about the eccentric axis possess a counter-current planetary movement with respect to the mixing plate, which movement may, for example, be effected either by rotating the mixing plate in a direction opposite to the rotation of the rods about the eccentric axis or by holding the mixing plate stationary and rotating the eccentric axis about the center of the mixing plate in the same direction as the rotation of the rods about the eccentric axis.

The knife-like rods must be so arranged that upon rotation about the eccentric axis they cut through the material to be mixed with the narrow edge leading.

Furthermore, the rake-like element or elements composed of such rods preferably are so arranged that such element or elements when rotating about its respective eccentric axis describes a circular path with respect to the eccentric axis, the diameter of which is greater than one-half of the diameter of the mixing plate. For example, when the mixing apparatus contains rods rotating about only one eccentric axis the resulting rake-like action must include a circular path, the diameter of which is greater than one-half the diameter of the mixing plate.

It is also possible, of course, to provide an apparatus producing the same action wherein the rotating rods revolve about several axes eccentric to the center of the mixing plate. In such instance, the sum of the diameters of the circular paths described by the rake-like elements when rotating about their respective eccentric axes should be greater than the diameter of the mixing plate. When the apparatus contains rods arranged to produce a rake-like action which rotate about two eccentric axes, the rake-like action obtained by the rods rotating about each eccentric axis preferably includes a circular path somewhat more than one-half of the diameter of the mixing plate, and the eccentric axes are preferably diametrically opposite to each other with respect to the center of the mixing plate and are synchronized so that the rods do not interfere with each other.

When the paths of the rake-like element or elements are of the above-described magnitude, a mixing action is obtained which does not merely affect the plastic material at one specific spot on the mixing plate as the paths of the individual knife-like rods which produce the raking action constantly cross over each other and cause the material being mixed to be drawn from one side of the mixing plate to the other.

The apparatus in accordance with the present invention is exceptionally suitable for preparing homogeneous mixtures from varied types of plastic substances. For example, plastic clays or similar materials which may contain an addition of coloring matter, resins and artificial resins, fertilizers, molten masses, raw refractory masses, bituminous masses and the like may

be easily mixed in apparatus in accordance with the present invention. The apparatus is also especially well suited for obtaining mixtures from plastic substances and requires relatively little power and only a short mixing period. One or several of the materials to be mixed may be plastic or the mass to be mixed may become plastic during the mixing operation, as is the case when pulverulent substances are mixed in the presence of liquids, such as waterglass, cementing agents, or when molten liquid masses solidify during the operation.

The individual knives or cutting rods producing the rake-like action can be arranged upon holders with greater or smaller distances between them, depending upon the type of material to be mixed. It is essential in each case, however, that such knives or cutting rods are arranged so that the material to be mixed is repeatedly subdivided into narrow strips in varying directions.

In the drawings accompanying and forming a part of the specification several specific embodiments of the apparatus in accordance with the invention are shown by way of example.

In the drawings:

Fig. 1 diagrammatically shows a top view of a mixing machine provided with rake-like elements rotating about one eccentric axis;

Fig. 2 diagrammatically shows a side elevation partly broken away and partly in section of the mixing machine shown in Fig. 1;

Fig. 3 diagrammatically shows a top view of a mixing machine provided with rake-like elements rotating about two eccentric axes;

Fig. 4 shows a plan view partly in section of a rake-like element and resilient supporting arm;

Fig. 5 shows a rake-like element in elevation;

Fig. 6 shows an enlarged plan view of a circular element provided with mixing tools arranged to produce a rake-like action upon rotation of the circular element;

Fig. 7 shows in elevation one of the mixing tools employed in conjunction with the circular element shown in Fig. 6; and

Fig. 8 diagrammatically shows the mixing action obtained with the apparatus shown in Fig. 1 or 6.

In Figs. 1 and 2 the mixing bowl 1 having the mixing plate 2 mounted on positively driven rollers 3 rotates in the direction of the arrow. Plate 4 closes the discharge opening during the mixing operation. The rake-like elements 5 are supported by arms 6 which are attached to the rotary shaft 7 which is arranged eccentrically to the center of the mixing bowl. The rotary shaft 7 rotates in a direction opposite to the direction of the rotation of the mixing bowl. The arms 6 are of such length that the circular raking action produced by the rake-like elements is of a diameter greater than one-half the diameter of the mixing bowl. The knife-like rods 8 of the rake-like elements 5 extend down substantially to the mixing plate 2 and are so arranged that they slice through the material to be mixed cutting such material into a plurality of narrow strips. The stationary scrapers 9 are provided to remove any of the material to be mixed which may stick to the side walls of the mixing bowl.

In Fig. 3 the mixing bowl 1 is provided with rake-like elements 5′ which rotate about two shafts 7′ and 7″, each of which is arranged eccentrically with respect to the mixing bowl. The rotation of the rake-like elements is opposite to the direction of rotation of the mixing bowl, as in the modification shown in Figs. 1 and 2. The rake-like elements are supported by arms 6′ which are connected with the rotating, eccentric shafts 7′ and 7″, and each of such elements contains the knife-like rods 8 which extend downwardly substantially to the mixing plate 2 of the mixing bowl and the raking diameter of which is greater than one-half the diameter of the mixing-bowl.

In Fig. 4 the rake-like element composed of the serrated holder 15 and the knife-like rods 26 is supported by arm 16 to which it is clamped by the screw clamp 17 which rigidly holds the rod 18 extending upwardly from the serrated holder. Arm 16 is resiliently connected with arm 19. This resilient connection is effected by the coil spring 20 which is in the housing 21 rigidly connected with arm 19. One end of the coil spring engages with such housing and the other end engages with the collar 22 which is around arm 16 and engaged therewith by pin 23. The spring is tensioned to urge the arm 16 to rotate counter-clockwise. The arm 16 rests upon flange 24 which is supported by arm 19 and is thereby held in normal operating position. This resilient mounting of the rake-like element, however, permits such element to swing upwardly in the event that it meets with an obstruction during a mixing operation.

Arm 19 is rigidly attached to the collar 25 for engagement with a rotating shaft arranged eccentrically to a mixing plate, such as shown in Figs. 1 through 3.

The knife-like rods 26 of the rake-like element are held in place by bolts 27 in the serrations of the holder 15. The holder 15 contains a sufficient number of serrations so that the spacing between the knife-like rods may be varied by adding to the number of the knife-like rods attached to the holder or by removing some of them.

In Fig. 5 a plan view is given of the rake-like element shown in Fig. 4. The holes 28 are to receive the bolts of further knife-like elements which may be attached to the holder if desired.

In Fig. 6 a circular element 30 is shown for supporting knife-like rods 31 and 32. The circular element 30 is provided with an aperture 33 for engagement with a rotating shaft arranged eccentrically to a mixing plate as shown in Figs. 1 through 3. The knife-like rods 31 and 32 are respectively attached to the circular element by clips 34 and 35 and extend downwardly from the circular element. Two of the knife-like elements 31 are attached to cross arms 36 of the circular element so that upon rotation of such element about the aperture 33 a rake-like action is obtained. It is, of course, possible to attach more knife-like rods to the cross arms of the circular element if a more intense raking action is sought.

The lower extremities of knife-like elements 32 are provided with horizontal bars 37, as may be clearly seen from the side elevation thereof in Fig. 7, which serve to loosen material from the mixing surface.

Fig. 8 shows diagrammatically the action of the apparatus shown in Figs. 1 and 2 upon plastic material 40. Paths 41 represent the paths of the knife-like rod 8 of the eccentrically rotating rake-like elements 5, and it may be seen herefrom how the intensive mixing action in accordance with the present invention is obtained.

JOSEPH EIRICH.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

J. EIRICH
MIXING MACHINE
Filed July 3, 1940

Serial No.
343,887
2 Sheets-Sheet 1

Fig. 1

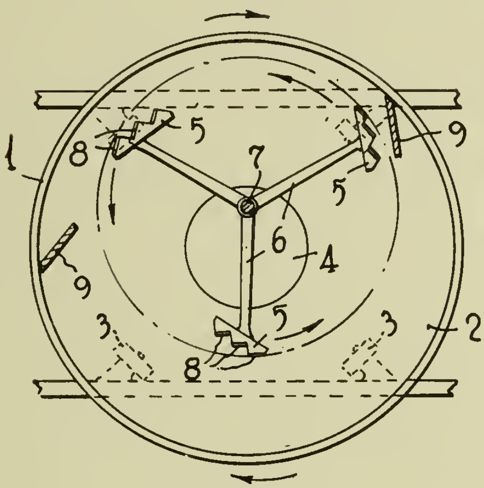


Fig. 3

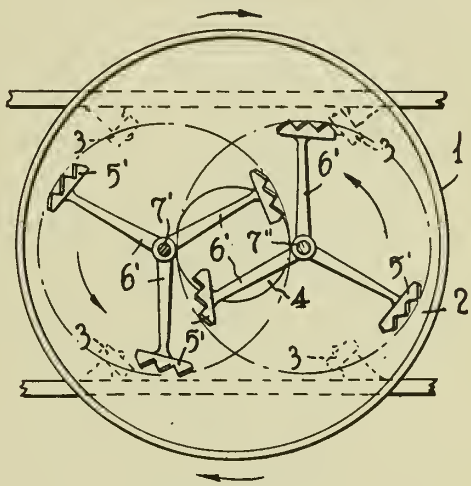


Fig. 2

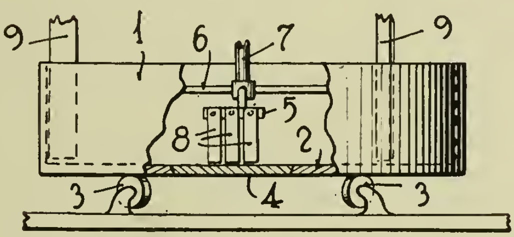
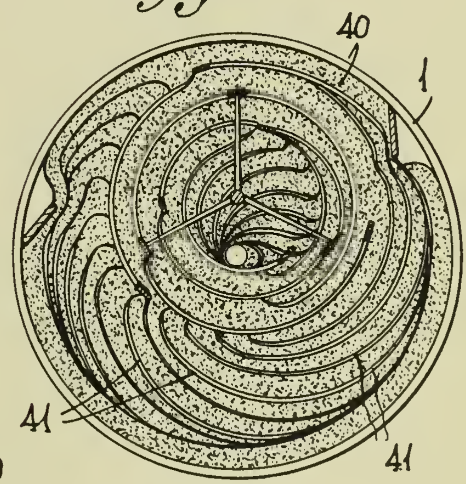


Fig. 8



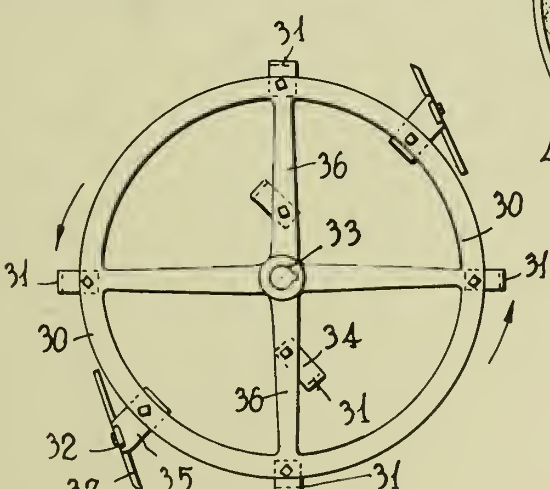
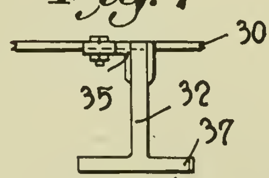


Fig. 6

Fig. 7



Inventor

Joseph Eirich

By Bailey & Larson Attorneys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

J. EIRICH

MIXING MACHINE

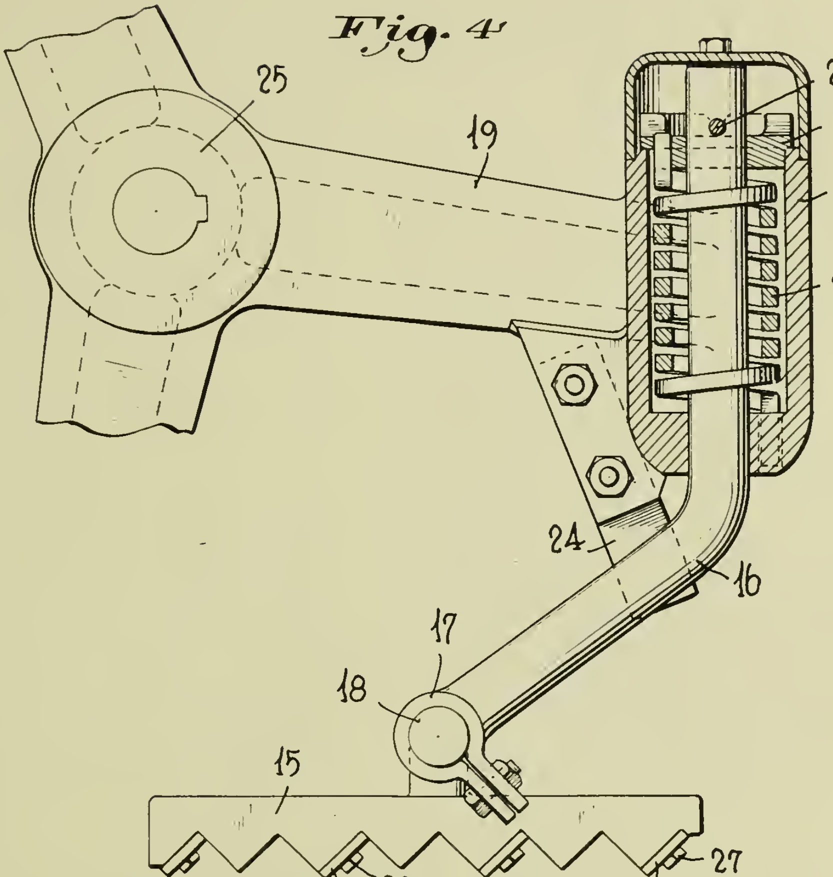
Filed July 3, 1940

Serial No.

343,887

2 Sheets-Sheet 2

Fig. 4



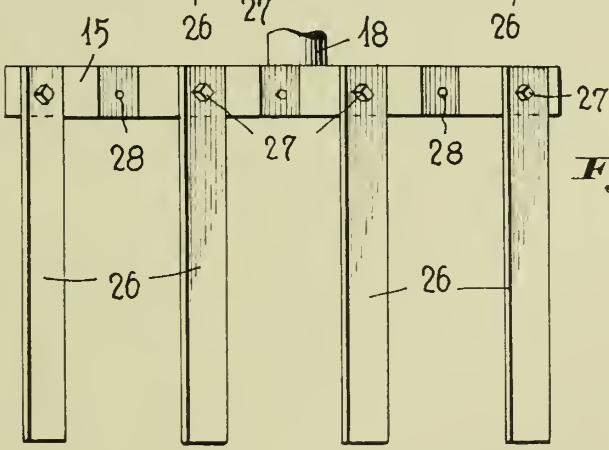


Fig. 5

Inventor

Joseph Eirich

By Bailey & Larson

Attorneys

Published May 25, 1943

Serial No. 344,165

ALIEN PROPERTY CUSTODIAN

CENTRIFUGAL SUPERCHARGES FOR INTERNAL COMBUSTION ENGINES

Alessandro Baj, Milan, Italy; vested in the Alien Property Custodian

Application filed July 5, 1940

The objects of the present invention are some important improvements in centrifugal compressors for supercharging internal combustion engines.

It is known that in order to obtain the best adiabatic efficiencies and the highest compression ratios from centrifugal compressors, it should be carefully avoided that the flow of air accelerated by the compressor should strike anywhere in its passage through the intake channels leading to the fan and between the fan and the fixed diffusing blades.

Experiment has also shown that the changes in speed should be gradual and congruent.

The higher the pressure-ratio of a fan and therefore the higher the peripheral speed, the more important is a correct and regular flow of the air stream. In modern compressors for supercharging aircraft engines, in which the speed of flow of the fluid, both in the conduits as in the fan, have attained the highest values recorded in the art, it is of the utmost importance to prevent the fluid vein from striking on anything.

The present improvements have the object of impressing to the fluid vein a motion approaching very nearly the theoretical flow and such to avoid the fluid from striking against anything on entering the fan.

A first improvement consists in this, that the compressor is provided with means capable of securing to the fluid entering the fan, besides axial (longitudinal) flow also a rotational motion having linear speeds, along the radius, substantially equal to those of the fluid flowing the fan.

The means capable of securing a rotational motion to the fluid entering the fan consist in a number of fixed blades, separated from the fans-blades by a very short air gap and having the exit side conveniently curved.

Another improvement consists in this that said fixed directional blading is curved helicoidally and receives the air from an air transporter in form of an helix, capable of imparting to the fluid a rotational component corresponding very approximately to the mean average value of the rotational component in the fan.

In practice, it has also been found that the shockless intake conditions of inflow are obtained approximately as theory has them only for a given value of the volume of flow, of the delivery pressure and number of rev. per minute; when these quantities vary there should be a change in the inclination of the single points of the exit edge of the directional blading. This can be obtained by making the last portion of said blading more or less inclinable.

Another innovation consists in this, that the change of the directional blades incidence is brought about by a servo-motor controlled by the supercharging pressure feeding the engine.

In order to disclose the importance of the invention it should be noted that a device used in many compressors for radial engines consists in using an intake spiral in front of the fan, having a simple radial blading; this device has the drawback of causing a free vortex wherein the highest peripheral speeds are towards the centre (hyperbolic law) with flow conditions which are absolutely the reverse of the real variation of linear velocities along the radius of the fan: (linear law increasing with the radius).

These and other innovations will be disclosed in the following specification and attached drawings, showing different profiles directional-blade shapes and of the centrifugal compressors pertaining thereto.

Fig. 1 is a sectioned elevation of a compressor with directional blading having an end portion movable.

Fig. 2 shows diagrammatically a portion of directional blading and of the fans blades developed in a plane, according to Fig. 1.

Fig. 3 shows another sectioned elevation of a compressor with movable directional blading.

Fig. 4 shows a view similar to Fig. 2 of the compressor shown in Fig. 3.

Figs. 5 and 6 are other similar views of alternatives, with sectioned fans, also developed in a plane.

Fig. 7 shows a sectioned elevation of a preferred embodiment for a compressor with variable directional blading.

Fig. 8 is a section of the above along line **8—8** of Fig. 7.

Fig. 9 shows velocity diagrams referring to a particular case.

With a particular reference to Figs. 1 and 2 the fan G is of the straight radial type and its vanes (see Fig. 2) are straight.

A shroud of convenient shape, forms the spiral delivery chamber C and the intake P or cowl, also in spiral form, the latter having directional blades **11** for the fluid, having a helical shape. Said blading is formed by a rear part **12** fixed to the cowl and by a front part **13** movable and controlled simultaneously by a lever **14**. In such a manner the fluid stream lines in motion assume a motion approaching very nearly to the motion of a fluid in theoretical conditions and such as to avoid striking at the entrance of the fan and forming vortices.

It happens also that the fluid stream-lines along the fans radius are directed along the resultant of the peripheral speed and of the longitudinal (intake) speed, i. e. the fluid at the entrance (of the fan) has, besides an axial (longitudinal) motion, also a rotational motion with linear velocities along the radius equal to those in the fan.

The helical shape of the blading **11**, due to the

particular snail volute shape of the cowl, impart to the (incoming) fluid a rotational component corresponding very nearly to the mean average value of the rotational component in the fan.

The alternative shown in Figs. 3 and 4 obtains the same result, by bending forward in the direction of motion the vanes **10a** of the fan G at the entrance of the fluid in the latter. The directional blading **11a** for the (incoming) fluid is achieved in this case by having the blades movable, so that they may take the desired angle of entrance.

The cowl P in this alternative is not in form of a spiral, due to the mobility of the rear part also of the blades, the same being pivotally mounted at the bottom on an ogival hub **15** so that the fluid may pass around it without incurring in losses.

In Fig. 5 is shown another embodiment of a fan wherein the vanes **10b**, towards the fluid intake, bulge, in a bulb so as to achieve high adiabatic efficiencies. In fact from this profile applied to the vanes of the fan and to the directional blading depends the critical value of the angle of attack, beyond which the stream lines leave the surfaces of the channels wherein they flow, creating good or bad conditions of flow in dependance of the induced turbulence.

In the alternative shown in Fig. 6 which follows the same ideas, the fan C has vanes **10a** as in the case of Figs. 3 and 4, whilst the directional blading **11c** has a double order of blades **16** and **17** of which one has movable blades and, when both orders of blades are movable, their members will have different intake angles and such as to secure a gradual directional lead of the flux.

Said blading members may be controlled either by a single controlling member or by one member for each order of blades.

The inventive principles disclosed may be achieved by providing a fan of the pattern mentioned above in combination with any of the above directional blading types or with other types, according to the various requirements of the particular technical conditions.

Likewise the blades control may be achieved in various manners: Figs. 7 and 8 show a preferred embodiment of said control.

The blades carry in correspondence of the pivoting outer pin **20** a small pinion **21** fixed on it and meshing with a front teeth gear **22** cut into a crown **23** turning within a seat cutout in a ring **24** placed in the intake chamber P of the compressor.

The control of crown **23** is obtained by means of pinion **25** which can be rotated from the outside through a lever **26** properly connected or not to the controlling members of the running conditions of the supercharger (intake pressure or outlet pressure, speed, outer atmospheric pressure, functional characteristics of the engine etc.).

The compressors obtained by following the above principles, have very greatly improved operating features, due to the dynamic conditions in which the fluid operates.

In the particular case of air-craft superchargers, the volume of air per second is bound to the number of revolutions of the engine. With a compressor driven by the engine by means of a multiplying gear with a fixed ratio, when no reductions are made in the channels sections before or after the compressor, for each number of rev. per minute there corresponds a certain value of the feeding pressure. If we suppose to be working at the altitudes for which the normal operations of the engine is calculated the maximum engine output is obtained exactly in the above conditions and with the highest pressure of air-feed; if the output has to be varied without varying the rev. per min. the feed pressure should be reduced as stated above, by reducing the section of flow either before or after the fan. Concerning the compressor this means an increase in delivery and a reduction in the volume flow, which condition causes the operation of the compressor on another point of its characteristic curve with a change in adiabatic efficiency and in power input.

With a compressor provided with movable directional blading according to the present invention, it is possible to change the features of the theoretical water head pressure of the fan (always keeping constant the rev. per min.) so that the new pressure head and volume flow correspond to a lesser power input, obtaining by throttling.

On analysing Eulers formula giving the theoretical head H_t it is found that

$$H_t=\frac{U_2C_{2u}-U_1C_{1u}}{g}$$

If in first approximation we consider a radial outflow, we obtain

$$H_t=\frac{U^2_2-U_1C_{1u}}{g}$$

where u = is the peripheral speed

C_{1u} = the peripheral component of absolute velocity. We can vary the term C_{1u} by varying the intensity of the direction of the absolute inlet velocity C_1 as shown in the diagram Fig. 9.

In such a case H_t will vary and namely will decrease for any increment of C_1 and for any increment in the inclination of the blades (reduction of angle α).

In our case these quantities are bound one to another by this that, on increasing the inclination of the blades, the free area of passage between the blades decreases.

These considerations on the triangles show also that the integral value of the changes in the momentum (quantity of motion) pressed on the fluid depends on the inclination of the directional blades; now the intake condition shows that a part of the energy of the fluid is returned to the fan precisely because it is found in this form. It will be therefore possible to obtain a decrease in the useful water head H_{ut} with a final energy balance-sheet better than when obtained by throttling.

In the case of a radial blading with intake edge bended forwards according to the direction of the theoretical triangles at the entrance, it is important for avoiding shocks to obtain an airflow with streamlines rigourously axial at inflow. In such a case the admission conduit has a blading in radial direction, and when the compressor will have to operate in conditions of utilization varying only slightly, the same blading may be fixed (non movable); otherwise, on reasoning as above, the blading will be made movable. In any case it will be convenient to design bladings which represent a compromise between the two fundamental bladings disclosed.

In practise, particulars of construction may vary in any way without thereby exceeding the limits of the invention and therefore the protection of the patent.

ALESSANDRO BAJ.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. BAJ

CENTRIFUGAL SUPERCHARGES FOR INTERNAL COMBUSTION ENGINES

Filed July 5, 1940

Serial No. 344,165

2 Sheets-Sheet 1

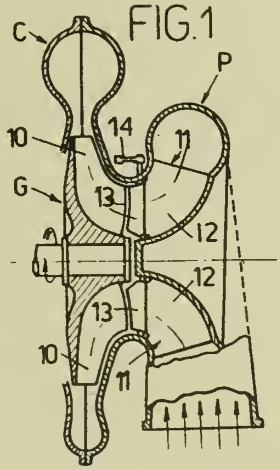


FIG.1

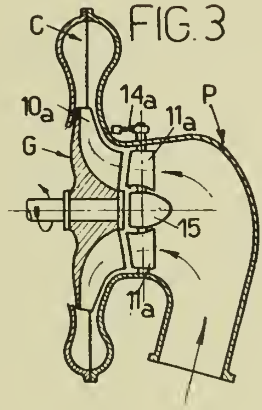


FIG.3

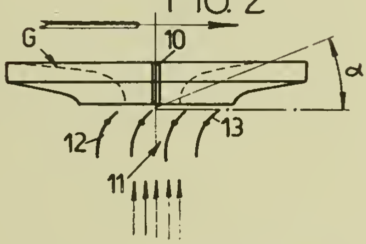


FIG.2

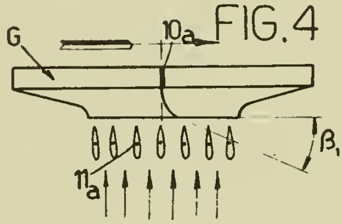


FIG.4

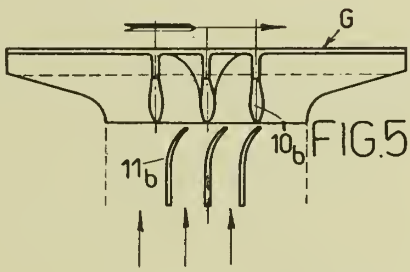


FIG.5

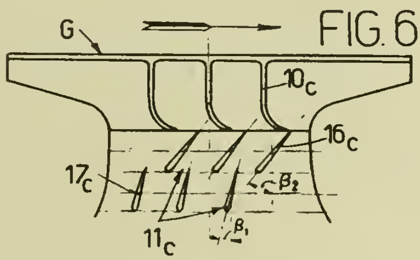


FIG.6

Inventor
Alessandro Baj
by Sommers & Young
Attorneys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. BAJ

CENTRIFUGAL SUPERCHARGES FOR INTERNAL COMBUSTION ENGINES

Filed July 5, 1940

Serial No. 344,165

2 Sheets-Sheet 2

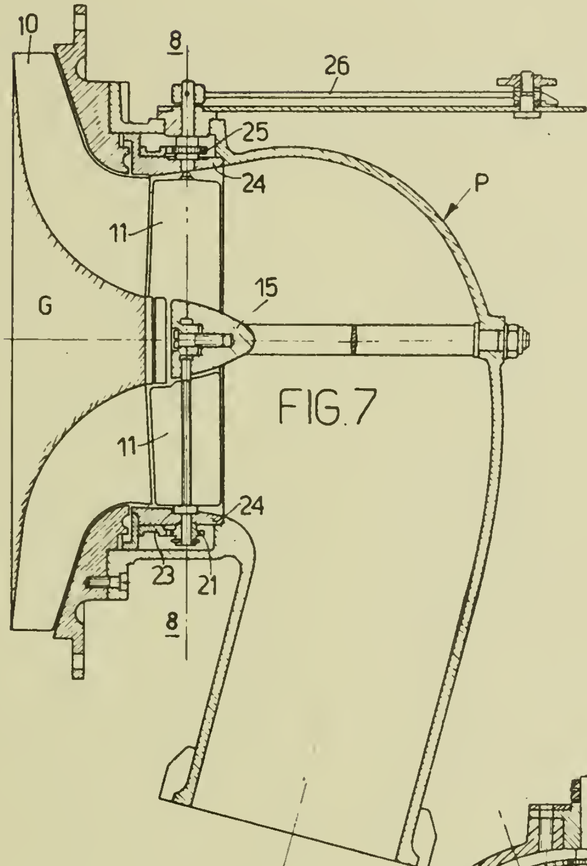


FIG. 7

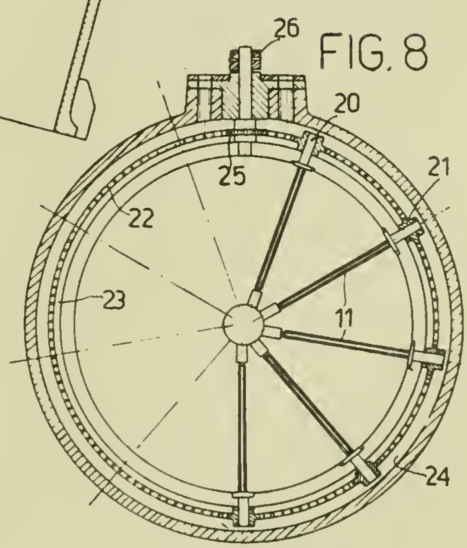
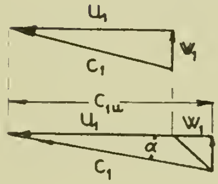


FIG. 8

FIG. 9



Inventor
Alessandro Baj
by Sommers & Young
Attorneys

Published May 25, 1943

Serial No. 344,454

ALIEN PROPERTY CUSTODIAN

CALCULATING MACHINE

Rudolf Martin, Seeburg (Osthavelland), and Otto Meuter, Klausdorf Kr. Teltow, Germany; vested in the Alien Property Custodian

Application filed July 8, 1940

This invention relates to a calculating machine in which the operating or driving position of catch pawls is adjusted by setting members for the purpose of determining the coupling distance for the driving members of the counting mechanism.

According to the present invention, the catch pawls, contrary to the arrangement of known machines, are jointed with the driven part of the coupling provided between the driving shaft and the members driving the counting mechanism, so that said catch pawls take part in the operation of the members driving the counting mechanism, striking against stops at the end. By the above described feature the construction of the machine is simplified considerably, moreover, contrary to known machines, special catch pawls for checking the kinetic energy of the gears of the counting mechanism can be omitted.

In order to make possible multiple addition or subtraction with one-time adjustment of the setting members, the driving members of the counting mechanism carrying the catch pawls, according to the present invention, are connected resiliently with the setting members so that the springs, which during the calculation are loaded or contracted depending upon the coupling distance, will bring back the driving members into the pre-set position after completion of the addition or subtraction. It is also worth mentioning that with this kind of calculating machines the subtraction is carried out by complementary counting mechanism. Advantageously the curved guide may be formed by a slot having a hook-shaped bend at the end and being provided in a plate which can be moved around the driving shaft and is equipped with an adjusting lever. The tens position can be effected with this type of calculating machine simply by moving the curved guide by one counting unit in the direction of driving by the tens shifting means. Means must, of course, be provided in this case to effect the return of the curved guide into its original position. It is essential to lock this movable curved guide in its various positions as soon as during operation of the machine the curved guide should tend to move about owing to the influence of the spring. Consequently, according to the present invention, the catch lever which engages the curved guide path is automatically locked by the crank shaft in its locking position.

Moreover, according to the present invention, the revolution counting mechanism and the result counting mechanism form a common counting mechanism, being connected by tens shift. The shifting means for the revolving counting mechanism can be disconnected so that either each revolution can be counted by the revolution counting mechanism, as usual, or by disconnection of its shifting means the revolution counting mechanism can be used for enhancing the capacity of the result counting mechanism in the case of higher values. In this way the scope of adaptation for this machine is considerably enlarged. A conventional calculating place can be provided for operating the revolution counting mechanism, whose setting member, however, can only be set on "0" or "1".

The separation of the counting mechanism into result counting mechanism and revolution counting mechanism can be marked, for instance, by painting the housing of latter in a different color.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawing showing by way of example and purely schematically some embodiments of the invention and in which:

Fig. 1 is a sectional view of a calculating machine having the invention applied thereto.

Fig. 2 is another sectional view of the calculating machine in order to better illustrate the parts provided on the ends.

Figs. 3 and 4 show different views of a number roller with the shaft of the counting mechanism.

Fig. 5 is a perspective view, showing a detail.

Fig. 6 is a perspective view showing the single parts of the number roller.

Fig. 7 is a front elevation of the calculating machine according to Fig. 1.

Similar reference numerals denote similar parts in the different figures.

Referring now to the drawings in greater detail, the main driving shaft **2** is mounted to revolve in the two side walls of the machine housing **1**. A gear **3** which is in mesh with a gear **4** is rigidly mounted at one end of the driving shaft **2**. Only a part of the periphery of the gear **4** is provided with teeth, the empty space skipping over the teeth of the gear **3**.

Mounted beside the gear **4** is a disc which engages with a second disc rigidly mounted on shaft **2** and designed like one arm of a Maltese gear. In this way the shaft **2** is prevented from turning when the teeth of gear **4** do not mesh with the gear **3**. The gear **4** is mounted on the shaft **5**, at one end of which the crank is connected for revolving the shaft **5**.

The members belonging to the single calculat-

ing places are mounted on shaft 2. Each calculating place consists of a disc 6 having a slot 7, for controlling the size of movement. This slot 7 has a recess 8 at its front end, the function of which will be described later. The discs 6 are mounted to turn freely on shaft 2 and are kept in their position by a pawl 9 which moves against a locking bar 10. The pawl 9 is impelled by a spring 11 which tends to move the pawl with the disc 6 in direction of the arrow *a*. This action of the spring is impeded, however, by the pawl 9 moving with its shoulder 12 against the stop bar 10. The pawl 9 has also a lug 13 projecting into the path of the tens shifting lugs of the correspondingly lower place, as will be described later.

A pin 14 which is fastened at 15 to an arm 17 of a calculating member 18 by means of a guide 15, projects into the guide slot 7. The member 18 is provided with teeth 19 which mesh with the gears 21 mounted beside the number rollers 20, thereby moving the latter. Setting of the calculating members 18 is done by means of the setting lever 22 rigidly mounted on a disc 23 which by the spring 24 is positively connected with the calculating member 18. Consequently, the member 18 is moved in the setting direction only by the spring 24 and the disc 23, whilst in the zero position the setting lever 22 strikes directly against a curve or bend 25 of the member 18 projecting into its path-way, thereby positively forcing this member into zero position. The disc 23 is also provided at its rear part with teeth 26 which correspond to the teeth 19 of the calculating member 18 and cooperate with a stop roller 27 for arresting the disc in the pre-set position. The stop roller 27 is fastened to a lever 28 which is mounted to move around a shaft 29. A spring 30 engaging at the lever 28 is constantly tending to move the lever anti-clockwise and thereby to engage the roller 27 with the teeth 26.

One end 31 of the lever 28 extending beyond the roller 27 cooperates with the crank shaft 5, or with a bushing 32 mounted on same, and on one side is provided with an abutment 33. This abutment in the rest position of the crank shaft 5 and also of the crank, not shown, is arranged opposite the end of the lever 31, and thus makes possible the escape of the lever 28 when setting the discs 23 as well as the driving discs 18. As soon as the crank shaft revolves, however, the whole periphery of the bushing 32 strikes against the end 31 of the lever 18, gripping it tightly. It follows that moving of the setting lever 22 during the operation of the machine is positively avoided.

Mounted on the shaft 2 between the disc 6 controlling the size of movement and the calculating member 18 is a driving disc formed with a lug 35 extending to the upper edge of the guide slot 7. This lug 35 engages the pin 14 and takes it along since, owing to the upper edge of the guide slot 7 and the edge 36 bordering the guide slot towards below, it cannot escape the disc 34. The pin 14 is moved along until it reaches the recess 8, where the lug 35 passes by it so that the pin 14 and also the member 18 cannot be further taken along with the lug 35. In this manner the member 18 is carried along always by a fixed amount that can be predetermined by setting of the lever 22. (Setting member 22 remains in its position and spring 24 is loaded).

The counting mechanism 37 consisting of the number rollers 20 and the gears 21 is mounted to slide transversely to the setting discs (decade slide) by means of the switching device 38, which is known and need not therefore be dealt with in detail. The number rollers are held in their respective positions by balls 39 which are pressed against the gear 21 by a spring 40. Each number roller is composed of a disc ring 41 carrying the numbers and a knurled disc 42, both of which are mounted on a hub 43 of the gear 21 and are fixedly secured thereto by bending the edge 44 of the hub 43. Each disc 42 has a lug 45 for the purpose of tens shifting and zero shifting. Moreover, the knurled disc has a mark 46 to facilitate correct assembling of the various parts. The number rollers consisting of the parts 21, 41, 42, are mounted on a shaft 47 having a slot 48. A rod 49 is mounted to slide in the slot 48 but is kept in its position of rest by a spring, not shown. The lugs 50 which are provided on the rod 49 for each of the number rollers can engage the lugs 45. By turning the handle 41 fastened to the rod 49, and withal the shaft 47, the number rollers are brought into zero position.

The number rollers are first arranged on the rod 49 and then, together with this rod 49, are mounted on the shaft 47. This proves advantageous in that the lugs 50 and the rod 49 can consist of one and the same piece.

In order to bring into mesh the gears 21 of the counting mechanism with the teeth 19 of the driving discs 18, the counting slide 37 is swingably mounted on a shaft 52 which at both ends of the machine is provided with an angle lever 53.

A rod 54 is mounted between the forward extensions of the angle levers 53 and engaged by a lug 55 of the slide 37 so that the slide can be swung independent of its position. The levers 53 with their opposite ends extends into the path of the crank pinions 56, mounted on the crank shaft 5. One of these crank pinions is mounted on the gear 4 and the other one on a lever 57 attached to the shaft 5.

A result counting mechanism 70 as well as a revolution counting mechanism 71 have been provided in the slide 37. Both of these are constructed to form one unit so that in any case they can be used jointly as result counting mechanism when figuring with large values. For this purpose the calculating place 72 which serves to drive the revolution counting mechanism, is set on "O". This calculating place does not differ from any of the others with the exception that the slot 73 which guides the setting lever 22, is only long enough to be set on "0" or "1". If the setting lever 22 of this calculating place is set on "1", provided that the carriage of the calculating mechanism is in normal position, the value "1" is transferred into the revolution counting mechanism with each turn of the crank which is thus registered and counted. If, however, the revolution counting mechanism shall not be used as such but the whole unit shall be used as result counting mechanism, the setting lever 22 of this calculating place is set on "0", thus preventing the transfer of any value from this calculating place.

The revolution counting mechanism has been painted in a different colour from the result counting mechanism in order to see at a glance which calculating places belong to the former and which to the latter.

The manner of operation of the device is as follows:

The value to be multiplied is introduced into the machine by setting the levers 22. Care must be taken that the counting mechanism slide is in

its correct position, and then the crank, not shown, is turned. As soon as the shaft **5** starts revolving, the setting levers **22** are locked by the stop lever **27, 28** which is prevented from escaping by the sleeve **32**. After the teeth of the gear **4** are in mesh with the gear **3**, the latter together with the shaft **2** is moved in the direction of the arrow *a*. Thereby the driving discs **34**, which are rigidly mounted on the shaft **2**, are carried along and in their turn engage the pins **14** of the set driving discs carrying them along until their escape into the recess **8** of their respective discs **6**. The driving discs **18** are correspondingly set. Previously the crank pinions **56** have engaged the levers **53** moving them until the gears **21** will mesh with the teeth **19** so that the movement of the driving discs **18** has been transferred to the number roller. As soon as a number roller has thus been switched from "9" to "0," the tends switching lug **45**, which is mounted on the number roller, will engage the lug **13** of the pawl **9** and turn it around its pinion **58** until its shoulder **12** is moved out of contact with the stop bar **10**. Consequently, the disc **6** is moved by one switching step by the action of the spring **11** so that the distance of the pin **14** of the next higher place from the recess **8** is increased by one switching step and thus the respective number roller is correspondingly moved on. A bar **60** has been provided on the front side of the machine with a lever **61** at one end, for the purpose of setting the discs **6** back by one step (one tooth). A roller **62** is mounted on the end of the lever **61** for cooperation with a lever **63** which in its position of rest assumes the position indicated by the full line in Fig. 2 and by means of a pin **64** is swingably mounted on one side wall of the machine housing. This lever **63** is moved from the position indicated by the full line in Fig. 2 into the position shown by the dash and dot line, by the crank pinion **56** which operates the lever **53** of the one side, and in this changed position the lever **63** moves the bar **60** by means of the roller **62** in such a way that the bar **60** with its bevelled part **65** engages the edge **66** of the disc **6** which has been set for carrying out a tens shift, returning same to its position shown in Fig. 1. In this position the lug **12** of the pawl **9** again catches behind the stop bar **10**, whereby the disc **6** is arrested.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capably of other embodiments than those specifically described and illustrated in the drawing.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

RUDOLF MARTIN.
OTTO MEUTER.

PUBLISHED	R. MARTIN ET AL	Serial No. 344,454
MAY 25, 1943.	CALCULATING MACHINE	
BY A. P. C.	Filed July 8, 1940	2 Sheets-Sheet 1

Fig. 1

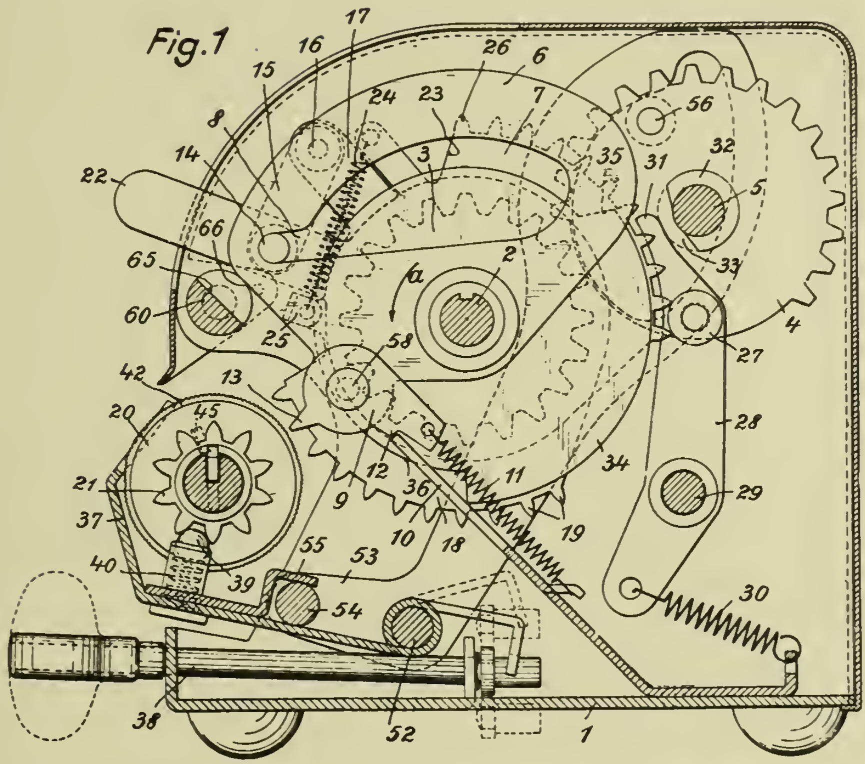
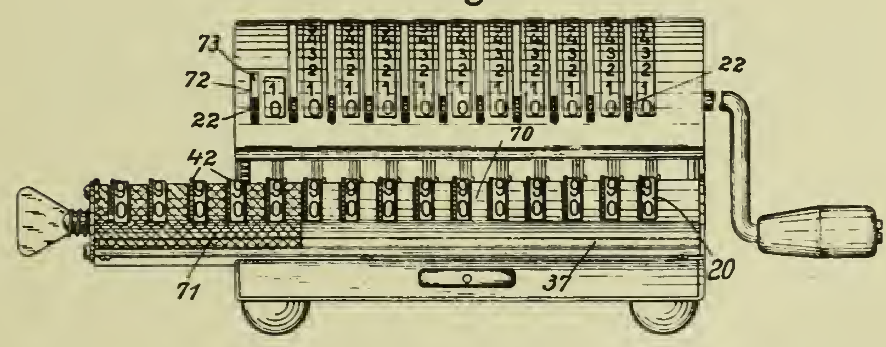


Fig. 7



Inventor:
R. Martin & O. Martin

By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. MARTIN ET AL

CALCULATING MACHINE

Filed July 8, 1940

Serial No. 344,454

2 Sheets-Sheet 2

Fig. 2

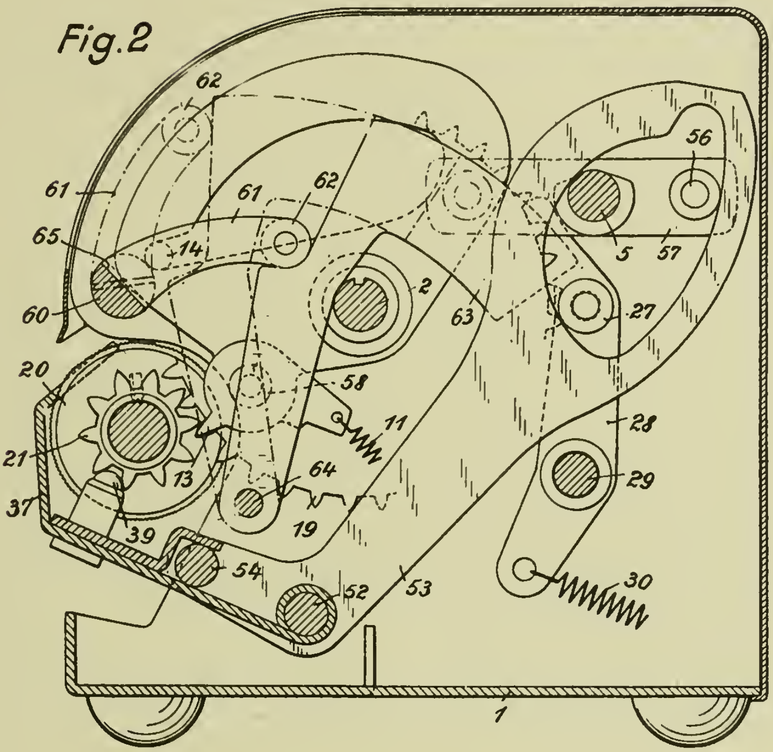


Fig. 3

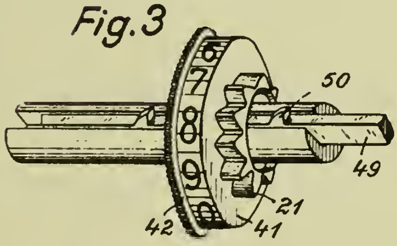
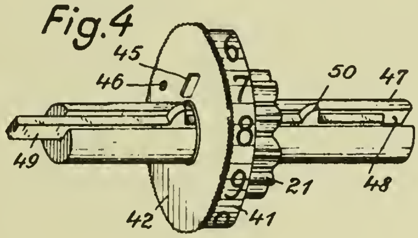


Fig. 4



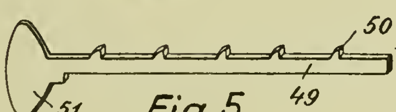
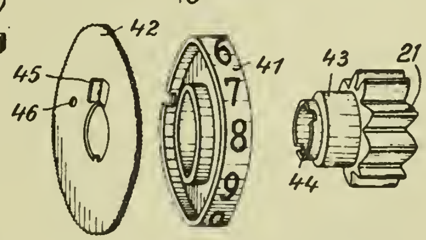


Fig. 5

Fig. 6.



Inventors,
R. Martin & O. Mouter

By: Glascock Downing & Seebold
Attys.

Published May 25, 1943

Serial No. 344,769

ALIEN PROPERTY CUSTODIAN

REFRIGERATOR

Bernhard Engels, Waldenburg-Altwasser, am Sandberg, Germany; vested in the Alien Property Custodian

Application filed July 10, 1940

This invention relates to a refrigerator which can be constructed and operated at low cost owing to the absence of complex electric or gas-heated equipment or mechanical parts.

The refrigerator according to the invention makes use of the principle, applied already to the cooling of butter, bottles, etc., of producing cold by evaporating water on the surface of a porous body consisting for instance of ceramic material. The structure comprises a boxlike cooling space, preferably made of glass, which is shut off from moisture and provided with a door and the necessary internal equipment, and a jacket of porous clay plates, etc., or forming a unitary molded body of porous, say, ceramic material. The jacket surrounds the cooling space at a distance, and the space between the jacket and the wall of the cooling space is filled with water which passes out through the pores in accordance with the degree of evaporation effected on the outside of the jacket to produce cold which in turn cools the water.

In the preferred embodiment of the invention the porous jacket of ceramic or other material is enclosed by a dense outer jacket, and in the space between the two jackets a flow of air is produced by causing room air to enter through an upper opening of the space and to pass out through a lower opening thereof which is preferably located diametrically eppositely to the first opening. In this way, evaporation on the surface of the ceramic body is considerably accelerated and intensified.

The flow of air, which is automatically brought about by the cooling of the air flowing past the moistened porous plates, can be increased by the provision of a small fan, electrically or otherwise operated, which is arranged either at the upper opening to introduce air or at the lewer opening to draw off air. The cost of such a simple ventilating plant is low, the installation of which, besides causing a considerable increase in cooling effect, affords, however, the advantage that the cooled air passing out through the lower opening from the space between the jackets and entering the roem where the refrigerator is kept cools also this roem or lowers the temperature thereef, which is particularly desirable in summer.

The flow of air between the jackets can be intensified also by ether suitable means, as a flame er resistance heater, arranged in a chimneylike attachment placed on the upper opening and causing an upward flow of air.

This arrangement makes it possible, furthermore, to use the refrigerator in winter time as heater, since the warm air continually flowing out of the upper opening effectively raises the temperature in the room concerned.

The efficiency of the refrigerator can be enhanced still more by enlarging the surface of the porous jacket. This can be done, for instance, by composing the jacket of plates having a wavelike profile or arranging several jackets one within the other and providing for outer watering of each of them.

One form of the invention is diagrammatically shown in the accompanying drawing which illustrates a refrigerator of which some parts are broken away for clearness' sake.

Referring to the drawing, *a* is an inner cooling space or container which is surrounded by a jacket *b* made of porous ceramic plates. *c* designates a dense outer jacket which, at a distance, encloses the inner jacket *b*. Between the porous jacket *b* and the outer wall of the cooling space *a* water is provided. The plates forming the porous jacket *b* are shown to have a wavelike profile. Into the space formed between the outer jacket *c* and the porous jacket *b* room air enters through an opening *d* shown on top to the right and flows out at *e* at the bottom to the left. A small fan *f* serves for intensifying air flow. *g* is a heating means which may be arranged at the upper opening *d*.

The invention is not restricted to the embodiment shown and described, but may be varied in many ways without departing from its fundamental idea.

BERNHARD ENGELS.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

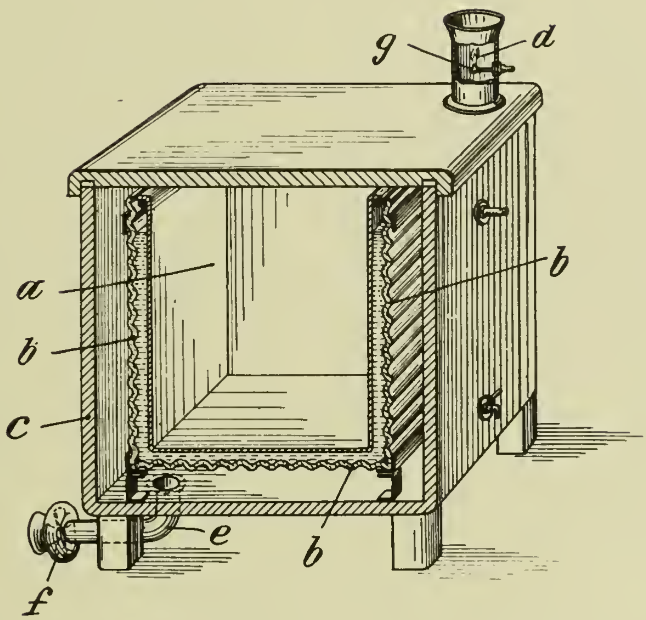
B. ENGELS

REFRIGERATOR

Filed July 10, 1940

Serial No.

344,769



Bernhard Engels

Inventor

By Owen & Owen

Attorneys

Published May 25, 1943 Serial No. 346,924

ALIEN PROPERTY CUSTODIAN

FASTENINGS OF INSTRUMENTS

Fritz Nallinger, Stuttgart, Germany; vested in the Alien Property Custodian

Application filed July 23, 1940

The invention refers to a fastening of instruments onto an object subject to vibrations, specially of a barometric box onto internal combustion engines, aeroplanes or the like. Such boxes are often used as so called controller boxes for aeroplane motors or other motors for high altitudes, in order to control any aggregate in dependence on the outer air pressure or on the pressure in the inlet piping of the engine, for instance to throw-in or -out the high altitude blower of the engine, in order to regulate its number of regulations.

Above all the object of the invention is a special suspension of the barometric box or of other instruments which excludes a damaging, specially a leaking of the barometric box in consequence of vibrations to which the object is subjected, onto which the instrument is suspended or secured. This refers specially to the vibrations arising in the operation of an internal combustion engine.

At the same time noises resulting from the loosening of fastening elements should be avoided as far as possible.

Furthermore the invention refers to specially safe and simple arrangements of such instruments, specially of barometric boxes, where an easy mounting and dismounting is of special importance.

A further feature of the invention is this, that the layers consisting of rubber or another yielding material for damping the vibrations should be connected to the instrument, and that preferably by adhesion, so that they may be removed together with the instrument as one unit, and that if for instance they shall be applied onto an object carrying this instrument, they necessitate no change of said object.

In the drawing two types of the new invention are illustrated by way of example, showing

In Fig. 1: a barometric box suspended according to the invention, partly shown in view and partly in longitudinal section,

In Fig. 2: the lower end of another barometric box with a somewhat altered suspension.

The barometric box *a* shown in Fig. 1 consists substantially of a corrugated or accordeon-plaited, thin walled sheet metal cylinder, closed at both ends by soldered-on base plates *b* and *c*. The interior space of the box is exhausted of air to a vacuum so that the box contracts or expands yieldingly with the alterations of the outer air pressure. Into the upper base plate *c* of the box a controlling rod *d* is air-tight inserted. By means of this rod the longitudinal alterations of the box are transferred onto the controlled parts of the engine.

In order to attain the required sensibility of the box for changes in the pressure of the outer atmosphere the case of the box should be manufactured of very thin material. This case, the material of which has already undergone a very hard stress with the manufacture of the corrugations or plaits, is liable to tear, if it is constantly subjected to vibrations.

In order to remedy this, the lower base plate *b* of the box is connected with the fastening plate *c* proper by means of a comparatively thick layer of soft rubber. As well the base plate *b* as also the fastening plate *e* is connected to the layer of rubber by means of any well known adhesive method, for instance by means of vulcanising. The fastening plate *e* is secured to the part *g* of the engine or aeroplane subject to vibrations by means of screws *f*. In this way the box is held in the predetermined position at the part of the engine or aeroplane without transferring the vibrations starting from the part *g* onto the box.

In Fig. 2 the same box as above is provided with a central pin *h* at its lower base plate. This pin sits in a comparatively thick walled soft rubber bushing *d''* which is inserted into a metal sleeve *i*. The securing of the rubber bushing onto the pin *h* and the bushing *i* respectively may be done either by means of surface pressure or by means of any of the well known adhesive methods. The sleeve *i* again is fastened onto the part *g* of the engine or aeroplane by means of screws *f*. The result in this case is the same as with the first type, i. e. the box *a* is protected against damage from the vibrations starting from the part *g*.

FRITZ NALLINGER.

PUBLISHED

MAY 25, 1943.

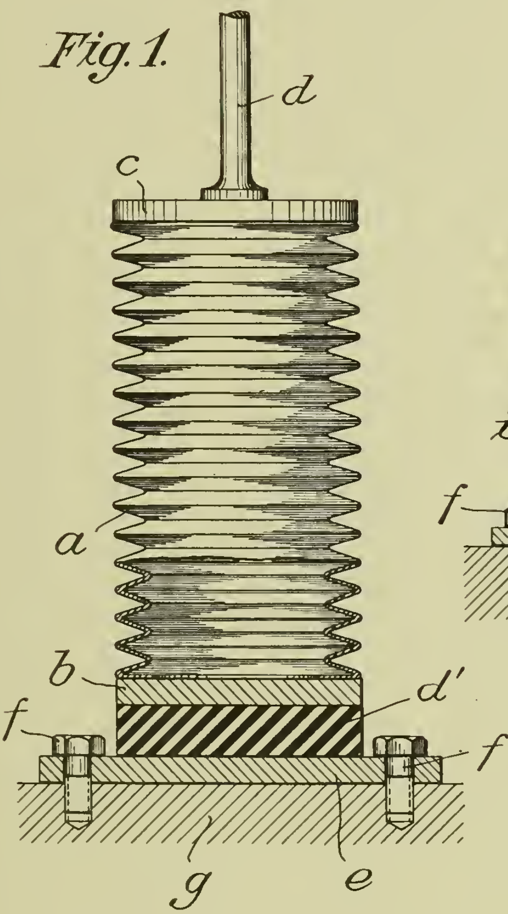
BY A. P. C.

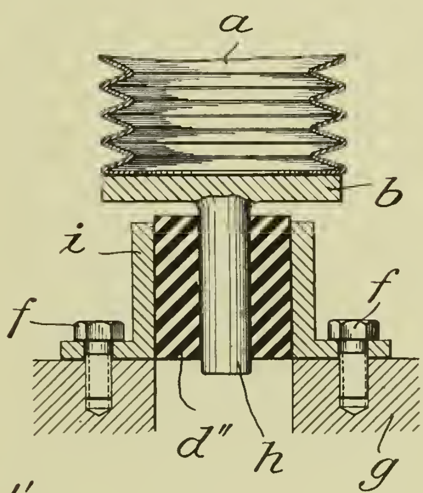
F. NALLINGER

FASTENINGS OF INSTRUMENTS

Filed July 23, 1940

Serial No. 346,924





INVENTOR
FRITZ NALLINGER
BY A. A. Wickel
Newell Bamman, Jr.
ATTORNEYS

ALIEN PROPERTY CUSTODIAN

CARRYING SYSTEM

Emile Torcheux, Paris, France; vested in the Alien Property Custodian

Application filed July 24, 1940

The present invention, system Torcheux, has for its aim to facilitate the carrying on the back of rigid trunks.

The invention is based upon the observation that the carrying is facilitated by holding the load sufficiently high.

In accordance with the present invention, this is achieved in a particularly advantageous manner by fastening the upper straps of the suspenders in sufficiently low places of the trunk, for instance, slightly above its center of gravity, and in bringing the lower straps of the suspenders to places situated below the trunk proper, preferably at the end, or at an intermediate place of the rigid legs serving for setting the apparatus on the ground when it is put into service.

The invention will be better understood in reference to the accompanying figures showing by way of example a particular form of execution of the invention without the latter being limited to said example.

The Figure 1 shows the apparatus placed on the ground and near it the suspenders serving for carrying said apparatus. In accordance with a known arrangement, the trunk A has four sliding legs *a*, *b*, *c*, *d* which can be fixedly secured in their slides *a'*, *b'*, *c'*, *d'* (of which only the two *b'* and *c'* are visible in the figure), by means of fluted knobs M, for instance.

Fig. 2 represents the trunk and its suspenders arranged for carrying. The two front legs (in the rear of the figure) have been pulled in while the two rear legs remain pulled out. By means of the devices shown, or by similar devices, the suspenders are then fastened on the one hand, at two places B and C situated sufficiently low on the rear side of the trunk (but preferably slightly above its center of gravity), and on the other hand, at the end of the two legs which remain pulled out.

The Fig. 3 shows the apparatus carried on the back of a person.

In these figures there should be noted especially the special form of the suspenders and more particularly their straps permitting the suspenders to be connected or disconnected in a very simple manner. To this end, the upper strap comprises a flat slightly curved metal piece forming a sort of flattened hook which slides when turned in the lodgings D and E visible in the Fig. 1. The lower strap is formed by a small cup into which the end of the leg slides and rests. The suspenders themselves comprise adjustment buckles F and G, as well as damping cushions I and J, which distribute the load in an elastic manner on the shoulders of the carrier.

It should be remarked that the adjustment of the suspenders and their adapting to the waist of the carrier can be carried out not only by setting the buckles F and G, but also by pulling out more or less the legs fixed by the fluted knobs.

The equipment of the trunk with regard to carrying it will be usefully completed:

By the half back belt seen at K in the Figs. 1 and 2. This back piece comprises preferably the cushions L and M which distribute the load on the back while at the same time moving slightly forwards the top of the trunk towards the head of the carrier.

By a front piece (not shown in the figures) which completes the afore-said half belt and which avoids the forward fall of the load when the carrier lowers himself.

By straps (not shown in the figures) which are attachable at the top of the trunk, extend in front of the shoulders and end in a loop, serving as a rest for the forearm of the carrier, while permitting at the same time the carrier to relieve himself of the load at times which he carries on his back.

EMILE TORCHEUX.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

E. TORCHEUX
CARRYING SYSTEM
Filed July 24, 1940

Serial No.
347,271
2 Sheets-Sheet 1

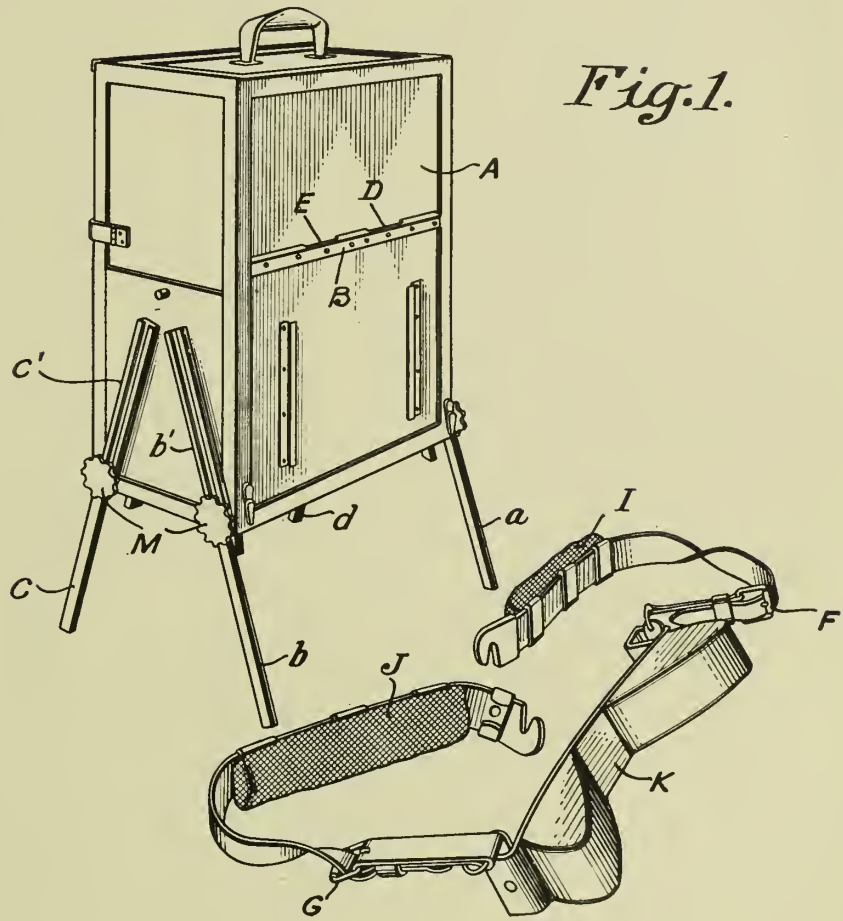


Fig.1.

Inventor
Emile Torcheux,

By H. S. Grover
Attorney

PUBLISHED
MAY 25, 1943.
BY A. P. C.

E. TORCHEUX
CARRYING SYSTEM
Filed July 24, 1940

Serial No.
347,271
2 Sheets-Sheet 2

Fig. 3.

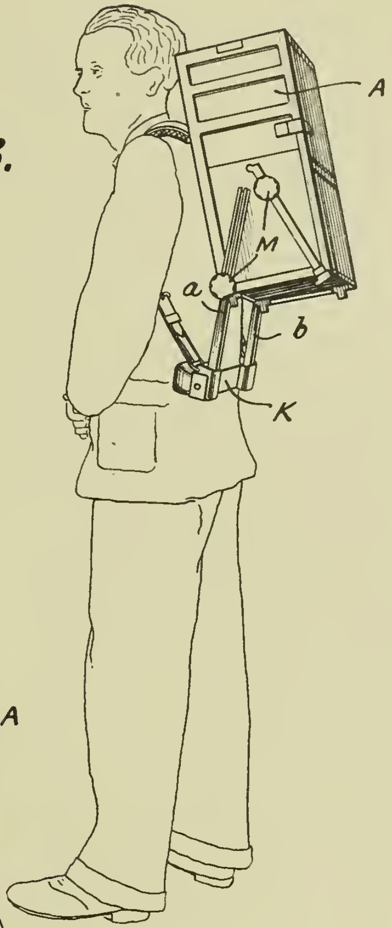
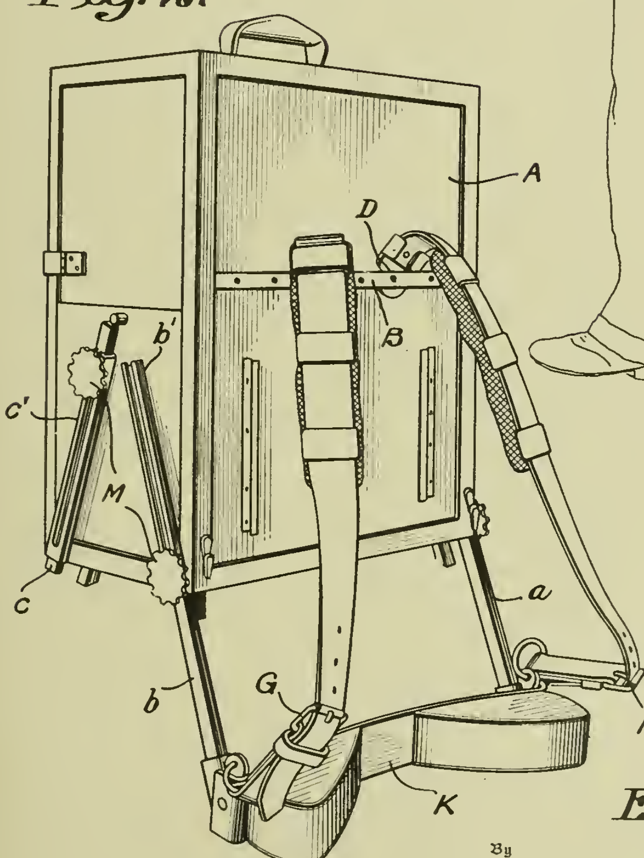


Fig. 2.



Inventor
Emile Torcheux.
By
H. S. Grover
Attorney

Published May 25, 1943

Serial No. 348,520

ALIEN PROPERTY CUSTODIAN

CLOSURES FOR CONTAINERS

Heinz Gräbener, Koln-Ehrenfeld, Germany; vested in the Alien Property Custodian

Application filed July 30, 1940

This is a division of application Serial No. 82,979, filed June 1, 1936.

The invention relates to improvements in fluid-tight tension ring closures for metal packing vessels and has for its object to provide a simplified device of this character affording a reliably tight fit of the ends of the tension ring and the possibility of adjustment thereof.

In the accompanying drawings:

Fig. 1 is a sectional view through the cover of a container, illustrating the invention applied to use;

Fig. 2 is a sectional view through the rim of the cover and the tension ring;

Fig. 3 is a fragmentary plan view of the closure;

Fig. 4 is a view similar to Fig. 2 on an enlarged scale;

Fig. 5 is a plan view similar to Fig. 3 showing the tension lever or inoperative position;

Fig. 6 is a fragmentary section through the cover of a container illustrating a modified form of the invention;

Fig. 7 is a fragmentary top plan view of the modified construction;

Fig. 8 is a transverse sectional view through the rim of the cover and the tension ring;

Fig. 9 is a view similar to Fig. 7 showing the tension lever in open or inoperative position;

Fig. 10 is a transverse sectional view on the line 10—10 of Fig. 7.

On the edge of the vessel *a* and enclosing the packing *b*, is located the cover *c* of the vessel, provided with a hollow edge, the tension ring *d* embracing the cover and edge of the vessel. On the ends of the tension ring are secured the closure parts *e*, *f*.

On the closure part *e*, of one end of the ring, the tension lever *h* is pivotally mounted at point *g* with the extension 1, which bears against the edge of the cover *c*. The extension 1 carries the tightening member 2, which is pivotally mounted at point 1. The lever *h* is bent off to the thickness of the closure parts *e*, *f*, so that the tightening member 2 slides closely over the same. Towards the middle of the cover the tightening member is chamfered in a downward direction over the whole length and the chamfered edge bears tightly against the closure parts *e*, *f*. The engagement projection 3, which is provided at the freely projecting end of the member 2, and is also made by bending round or turning down the corner, engages selectively in the engaging slots 4 of the closure part *f* and at the same time, owing to its hook-like structure grips under the closure part *f* in such a way that any pressing downward is prevented. When engaging in the slot 4, selected in accordance with the desired degree of tension, the engaging projection 3 fits into the whole length of the slot. It is thus made difficult for the tightening member 2 to be swung down and thus the tension lever *h* is effectively secured against snapping back into the open position. The holes 5 are intended to receive a sealing wire, (Fig. 3). Fig. 3 also shows that in the case of both the largest as well as in the smallest tension position the axes of pull *x*—*x* and *z*—*z* form an acute angle with the tangent *y*—*y* on the side opposite the tension lever *h*. Fig. 4 shows a partial side view of the tightening member 2, to an enlarged scale, the said member being bent at the portion 6 disposed towards the center of the cover, in such a way that it also embraces the closure parts *e*, *f*, from below. As a result the stability of the closure is increased to a further extent. Fig. 5 shows the tension ring closure according to the invention in the open condition. The surface of the tension member 2 is provided with advertising matter.

In the modification shown in Figs. 6 to 10, the tensioning of the closure is effected by swinging the lever *h* towards the edge of the cover, in which case through the bearing of the widened part 1 of the lever *h* against the edge of the cover, one end of the ring is drawn toward the vessel edge. At the same time the closure part *f* is gripped by the tightening member 2 and the other end of the ring is also tightened. The axes of pull *x*—*x* and Z—Z, which correspond to the smallest and largest tension position of the tightening member 2, form an acute angle with the tangent *y*—*y*, applied to the junction point of the ring, in the same manner as described previously, the apex of this angle lying opposite the tension lever.

The closure parts *e* and *f* are provided with the longitudinal eyes 7 and 8 arranged towards the middle of the cover and through which the securing pin 9 is inserted in the closed position. The longitudinal eye 8 of the closure part *e* is open at the side towards the edge of the cover, so that when the lever *h* swings into the open position the limiting part 10 of the tension lever projects into the open side of the longitudinal eye 8 (Fig. 9). On the other hand, the part 10, when the securing pin 9 is inserted, presses against the latter, so that it is not possible to open the closure (Fig. 10). The projecting end of the securing pin 9 has a hole 11 for receiving the sealing wire or the end, if the pin consists of soft metal, may be flattened to form a seal head 12.

In storing and for transport, the operative position of the lever *h* and engagement in the longitudinal slots 4 is sufficient to secure the tension lever against snapping back. The securing of the closure by means of the pin 9, however, affords absolute guarantee against tampering by unauthorized persons.

HEINZ GRÄBENER.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

H. GRÄBENER

CLOSURES FOR CONTAINERS

Filed July 30, 1940

Serial No. 348,520

2 Sheets-Sheet 1

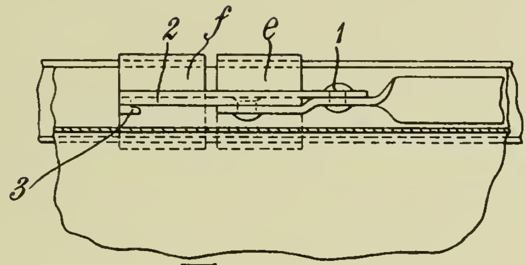


Fig. 1

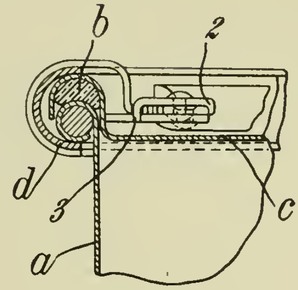


Fig. 2

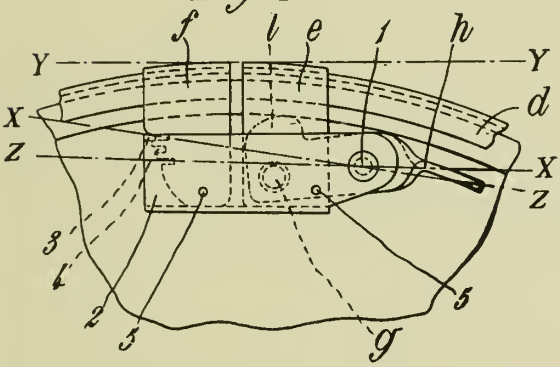


Fig. 3

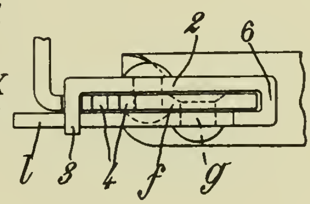


Fig. 4

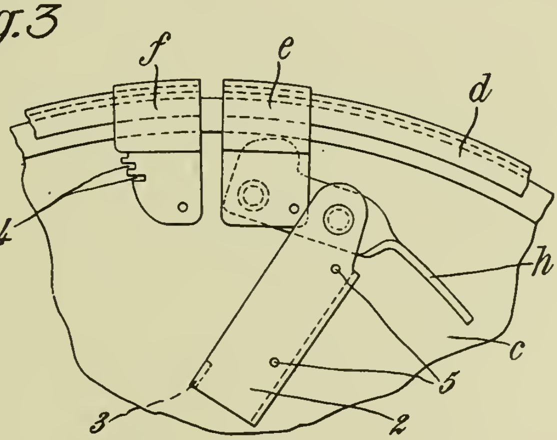


Fig. 5

H. Graebener
Inventor

By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

H. GRÄBENER
CLOSURES FOR CONTAINERS
Filed July 30, 1940

Serial No.
348,520
2 Sheets-Sheet 2

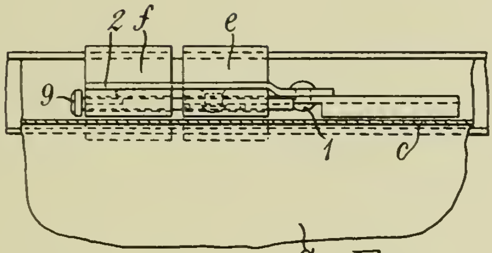


Fig. 6

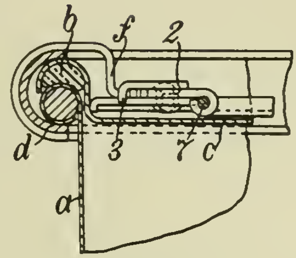


Fig. 8

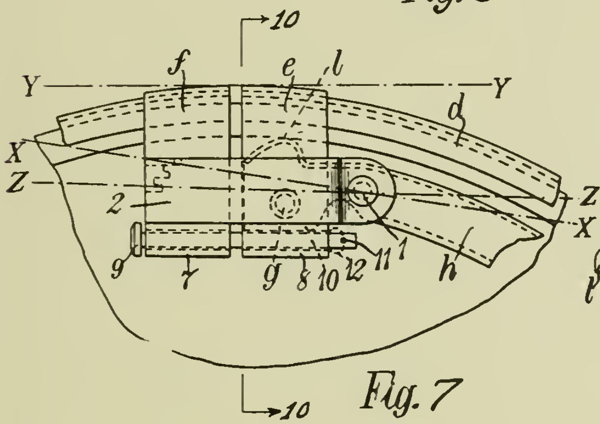


Fig. 7

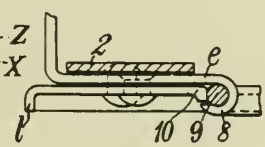


Fig. 10

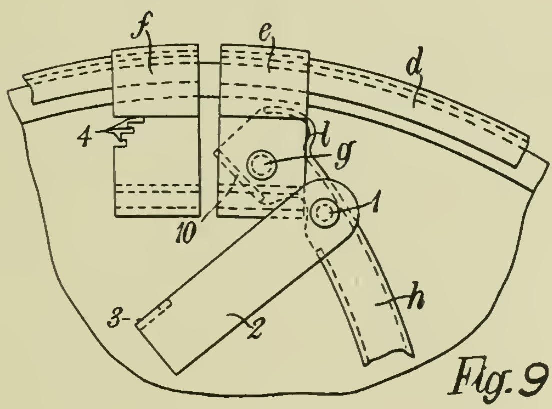


Fig. 9

H. Graebener
Inventor

By: Glascock Downing & Seebold
Att'ys.

Published May 25, 1943

Serial No. 351,777

ALIEN PROPERTY CUSTODIAN

BEARINGS

Biagio Beria, Turin, Italy; vested in the Alien Property Custodian

No Drawing. Application filed August 7, 1940

This invention has for its object a process of manufacturing ball bearings in which all elements or parts thereof, such as balls, rollers, needles, races, rings with or without races, are made of a special steel which through a suitable heat treatment and nitriding acquires a very high surface and core hardness.

It has already been ascertained that nitrided steels may be advantageously used in the construction of bearings capable of resisting hard wear, such as occur in ball and similar bearings working at very high speeds. Thus, for instance, in this particular branch of mechanical construction, steels have been extensively used of a grade containing: 2% C, 12% Cr. and 2% W; or 1.5% C, 18% Cr., or 1.5% C, 15% Cr. 1% Mo and 1% V. Roller and like bearings made of these nitrided steels cannot however be used when the external load exceeds a certain value, owing to the fact that the rolling members and races are subject to crushing owing to poor hardness of the core after nitriding.

The ball and similar bearing according to this invention is made of a steel which is distinguished from the steels above mentioned in that its composition is such that, after nitriding, the austenite is changed into stable martensite, which is notoriously the hardest component of ordinary steels.

The critical composition of the steel according to this invention is as follows:

C=0.75% Cr=4% Mo=8% V=1%

This steel, when hardened at 1175° C in oil, shows a stable austenitic structure at room temperature; when exposed to nitriding at about 500° C during 100 and and more hours, the austenite is changed into martensite, which is stable both at a temperature of 500° C and at room temperature.

A further important feature of the steel according to this invention consists in that it acquires a superficial hardness such as has not yet been attained by any other nitrided steel.

The following table shows the composition and surface and core hardness values of two standard nitrided steels in comparison to the steel according to this invention.

	Standard steels		Steel according to this invention
C%	0.37	1.51	0.75
Cr%	1.42	15.2	4.05
Mo%	0.21	1.08	7.80
Al%	0.68	-----	-----
V%	-----	0.95	1.10
Hardness, core	240 −250	540 −550	800 −850
Vickers, surface	1000 −1100	1200 −1250	1300 −1400

Owing to the higher values of surface and more particularly of core hardness, which is equal to and higher than the hardness obtainable with the standard chromium steels thoroughly hardened and not nitrided, the parts of ball and like bearings made of the steel according to this invention may resist crushing stresses such as may be produced by the highest working loads accompanied by severe wear actions on the surface.

The above indicated critical composition of the steel according to this invention is the optimal one; good results may however be obtained if the component percentages are varied as follows:

C=0.5–1.5% Cr=4–8% Mo=3–10% V=0.5–1.5%

Small quantities of titanium, silicon, manganese and tungsten may also be added.

BIAGIO BERIA.

Published May 25, 1943

Serial No. 351,470

ALIEN PROPERTY CUSTODIAN

DISINTEGRATORLIKE DEVICES

Max Aurig, Munchen O 27, Germany; vested in the Alien Property Custodian

Application filed August 5, 1940

This invention relates to a disintegrator for purifying, cooling and mixing gases.

In the known types of such disintegrators or disintegrator-like devices possessing both rotary and stationary or only rotary concentric annular frames formed of bars the latter comprise angles, flats, ledges and units having the form of a vane or turbine blade. Of all these kinds of bars at present in use, regardless of their relative arrangement, only the front or striking side thereof contacting with the gas and liquid mixture is utilized as a rule for the washing effect. In the course of time incrustations of dust form on the back of the bars which require therefore periodical cleaning or replacement. It has been found that this condition is due to the fact that the bars are surrounded by the washing liquid only incompletely or not at all.

The invention eliminates this drawback by imparting to the bars a drop-shaped section which offers minimum resistance to a flowing medium which, furthermore, surrounds the entire surface thereof, so that the full surface of the bars is utilized for washing, cooling or mixing a gas. This shape of the bars affords, moreover, the added advantage that a rarified air space creating a suction effect cannot form and the power consumption of the device can thus be considerably reduced. Still another advantage is that incrustations cannot form on the surfaces of the bars.

The bars according to the invention may be solid or hollow, but their direction must be adapted to circumferential speed and the speed of travel of the gas while taking into consideration that always the entire circumference is uniformly surrounded by the washing, cooling or mixing liquid. In the most favorable position the longitudinal axis of the drop-shaped section is parallel to the direction of flow of the medium surrounding the body.

The invention is illustrated by way of example in the accompanying drawing, in which

Figure 1 shows part of a disintegrator according to the invention provided with a stationary annular frame of bars and rotary frame sections and

Fig. 2, the use of rotary bars only

In the construction shown in Fig. 1 the rotary sections of the frame are formed of bars *a* and the stationary section of bars *b*. The direction of motion is indicated by arrows. It will be seen that in the rotary sections the bars *a* have a direction coinciding approximately with the direction of rotation whilst the direction of the bars *b* in the stationary section is almost directly opposed thereto.

In the arrangement shown in Fig. 2 all the bars *b* are set in the same direction, namely, the direction of rotation.

MAX AURIG.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

M. AURIG
DISINTEGRATORLIKE DEVICES
Filed Aug. 5, 1940

Serial No.
351,470

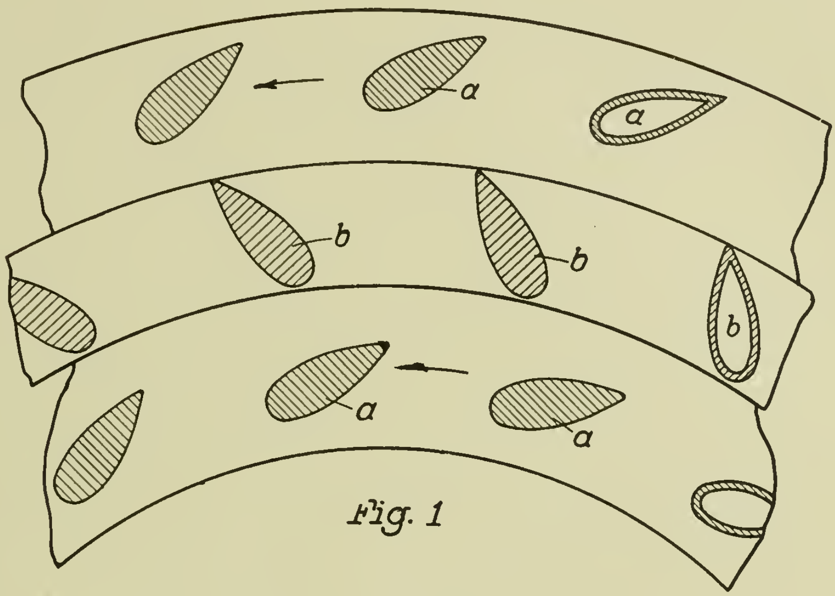


Fig. 1

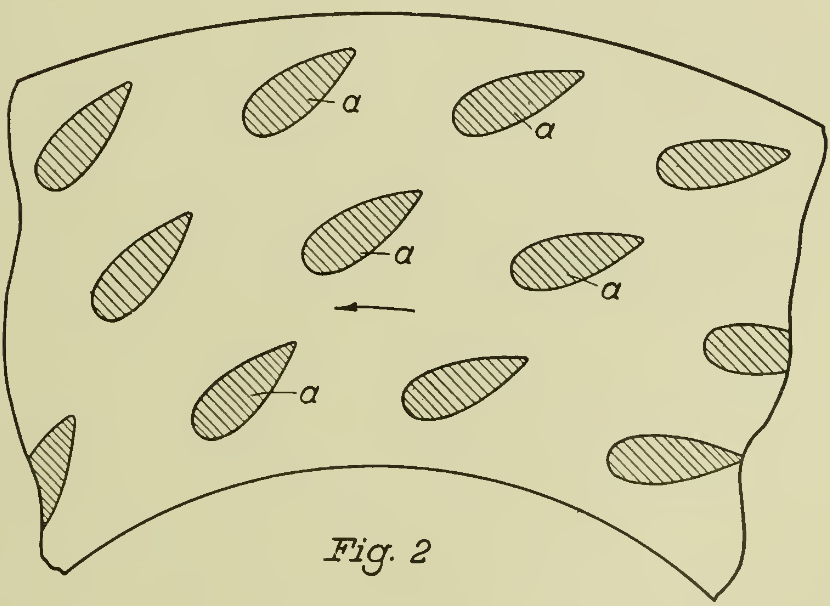


Fig. 2

Inventor:
Max Aurig
Henry J. Lucke
HIS ATTORNEY

Published May 25, 1943 Serial No. 352,111

ALIEN PROPERTY CUSTODIAN

RECORDING SPEED INDICATOR

Franz Förnbacher, Villingen/Schwarzwald, Germany; vested in the Alien Property Custodian

Application filed August 10, 1940

The invention relates to a recording speed indicator, known as tachograph, intended in particular for the supervision of the operation of vehicles. This apparatus contains a dial or disk driven by a clock mechanism and written upon by writing elements adjusted corresponding to the changing operating conditions of the vehicle to be supervised and thus producing a record on the dial permitting of subsequently ascertaining the manner of the driving.

So far these apparatus were as a rule constructed in such a way that after recording on a dial within a period of, for example, 24 hours, the casing of the apparatus was opened and the dial containing the record had to be replaced by a new one. This had the disadvantage, of course, that operating conditions exceeding, for example, 24 hours could not be supervised without opening the casing. Such apparatus are therefore not suited for effectively supervising vehicles which have been on the way for longer periods, for example, one week.

For this reason it has been endeavored in the past to superpose in such speed indicator several dials driven by the clock mechanism and to guide these dials in succession in front of the recording elements. This, however, entails the difficulty of removing the dial, after having been written upon, from the range of the writing or recording elements and of guiding the next following dial in front of the writing elements. It became necessary, therefore, to provide in the circular dials sector-shaped cuttings through which the writing elements, after having produced a record on the first dial, could pass to operate on the next following dial. But the arrangement of such sector-shaped cutting in the dial, so far considered absolutely necessary, has the drawback of reducing the available writing surface of the dial which under certain conditions may result in impairing the accuracy and the clearness of the records. In addition, such dials with sector-shaped cuttings will require for their actuation a clock mechanism of a special kind, since the usual 24-hour division must be distributed not over a closed circular dial of 360°, but over a correspondingly smaller circumference. For this reason there cannot be used for these dials a standard clock mechanism with a rotating period of 24 hours for 360°.

According to the invention this disadvantage is avoided by making radial dials, also provided if called for with additional approximately quadrant-shaped slots, superposed in known manner with corresponding adjustment toward one another, by means of a stationary guiding member engaging the radial dial slot in succession and progressing disengagement of their actuating operation from their position of readiness below a table, preferably used as writing support, transferable upon such table and, after one rotation and after having produced a record, into a collecting chamber. Hence, with this arrangement the dials need not have any sector-shaped cuttings, the said radial slot will suffice, and not impair complete utilization of the dial to 360° of its circumference. For this reason the apparatus may be equipped with a standard clock mechanism.

The gradual transfer of the dials by means of the stationary guiding member from their position of readiness into a collecting chamber results in a reliable transport of the dials owing to their gradual disengagement from the actuating mechanism. For this reason no impairment is to be apprehended of the regular succession of the individual dials.

Further particulars of the invention will be disclosed by the following description of some modes of construction shown by the drawings.

Figure 1 shows in diagrammatical presentation one mode of construction of the apparatus in opened condition.

Figure 2 shows one of the dials used with this apparatus.

Figure 3 shows a perspective view of the interior of one of the halves of the casing.

Figure 4 shows a perspective view of the interior of the other half of the casing.

Figure 5 is a section of the line A—B of Figure 4.

Figure 6 is a vertical longitudinal section through the casing part according to Figure 4.

Figure 7 shows a section according to line C—D of Figure 3 on an enlarged scale.

Figure 8 shows in diagrammatical representation another mode of construction of the apparatus in opened condition.

Figure 9 shows one of the dials used with the apparatus.

Figure 10 shows a perspective view of the interior of one of the halves of the casing of the mode of construction according to Figure 8.

Figure 11 shows a perspective view of the other half of the casing of this apparatus.

Figures 12 and 13 show the halves of the casing in different side views according to Figure 11.

Figure 14 is a section according to the lines E—F of Figure 10 on an enlarged scale.

Figures 15 and 16 show several superposed dials

to be used with the apparatus according to Figure 1, and a part of their driving elements in plan view and vertical longitudinal section.

Figures 17 and 18 show in differing scales another mode of construction of the dial drive in plan view and in section.

Figures 19 and 20 show two further modes of construction of dials.

In both modes of construction (Figures 1 and 8) the apparatus consists of a casing 1 accommodating the driving mechanism (not shown) for the writing elements 2. These writing elements are coacting with dials whose driving clock mechanism (not shown) is accommodated in the cover 3 pivotally connected to the casing 1. The cover 3 having been closed, the casing will be lockable, so that the recording process on the dial cannot be tampered with.

Several dials which are to be written upon are to be accommodated in the cover 3 of the casing in such a manner that they are guided in succession in front of the writing elements 2, permitting an uninterrupted record extending over several periods, for example, several days.

In the mode of construction according to Figures 1 to 7 there is provided on the spindle 5, rotated by the clock device 4, a disc 6 having pins 7 at its circumference. On this disc or the pins 7, respectively, may be placed a stack of dials S (Figures 15 and 16) consisting of several, for example six or seven, superposed dials. One of these dials *s* is shown in Figure 2. The circular dial *s* shows on its front side, in addition to a time division provided at the circumference of the dial distributed over 360° and running from 0 to 24, those co-ordinate lines not shown in Figure 2, which will be necessary for the subsequent interpretation of the records obtained. Each dial is also slitted alongside a radius *r*. This slot does not extend up to centre hole *l* serving for placing the dial on the spindle 5 of the clock mechanism, but continues in an arc-shaped slot *t*, extending approximately over a quadrant. Thus, there is cut out, as it were, by the slots *r* and *t* from the dial *s* a flap *p*, still connected with the dial, said flap permitting of being bent outwardly from the plane of the dial.

Concentric to the centre hole *l* the dial shows small holes *u* corresponding to the number of the engaging pins 7 (Figure 6), the pins passing through said holes when placing the dial. As will be noted in particular from Figures 15 and 16, the dials *s* comprising the stack S are held by a sector-shaped carrier 8, having in the centre a sleeve projection 9 extending through the dial holes *l*, said sleeve projection permitting of placing the carrier on the driving spindle 5, rotated by the clock mechanism. The carrier at its circumference is provided with several, for instance seven, pin-like teeth 10, extending through corresponding recesses *v* superposed in the same alignment and provided at the edge of the dial. Thus, the stack of dials placed on the spindle 5 of the clock mechanism is carried along not only by the pins 7, but at its periphery also by the teeth, engaging the recesses *v*, of the sector-shaped carriers 8 also taken along by the spindle 5. This carrier 8 co-acts with the dials within the range of their radial slots *r*. The teeth 10 of the carrier serve principally for ensuring satisfactory taking along of the dials *s* within the range of their slots *r* and for maintaining the proper position of the consecutive dials *s* in the stack of dials S.

Figure 15 shows in particular that the superposed seven dials, provided in this case, are somewhat displaced toward one another in the direction of the circumference, so that not all radial slots *r* of these seven dials are located under one another.

At the front edge of the flap *p*, permitting of being bent upwardly, is further provided a recess *w*, the purpose of which will be elucidated in the following.

The stack of dials S, described in the foregoing, having been pushed onto the driving spindle 5 and over the pins 7 and 10, respectively, a table top 11 is placed over this stack, said table top covering the clock mechanism and the dials and being pivotally arranged around a link 12 in the cover 3 of the casing and secured in this effective operating position by a bolt spring 13.

The table top 11 is of annular construction and in its centre is provided with an aperture through which may extend the spindle 5 for permitting cooperation with the driving parts arranged in the casing 1. When the cover is closed, the table top 11 is located at such a distance from the writing elements 2 that a dial moving across the table top will be in a position to properly take up the recording marks of the writing element.

In the direction of movement of the clock mechanism and, respectively, of the dials in front of the writing range 14 of the table top 11 is provided in the latter a slot 15 extending in approximately radial direction, the width of said slot being so selected that the upwardly bent flap *p* of the top dial *s* of the stack of dials can pass through this slot. The slot is followed by a tongue-shaped projection 16 extending from the edge of the slot 15 facing the writing range 14 contrary to the direction of movement of the dials *s* downwards to the stock of dials and tapering towards its free end (Figures 4 and 7).

When turning with the aid of the clock mechanism the stack of dials in the sense of the arrow, the fore end of the tongue 16 enters the recess *w* of the top dial and extends under the flap *p* of the dial. In consequence thereof this flap *p*, when the dial continues to rotate, will proceed upwardly over the tongue 16 and through the slot 15 and reach the surface of the table top 11, viz., over the writing range.

The edge of the slot 15, away from the writing range, carries a leaf spring 17, pressing the dial against the table top 11, thereby securing the position of the dial during the recording process.

Acting upon the gradually progressing transfer of the dial, from the position of readiness below the table top 11, to this table, the dial will also be released from its driving connection, viz., from the pins 7 of the carrier plate 6 and also from the teeth 10 of the carrier 8. The teeth 10 coacting with the recesses *v*, provided at both sides of the dial slot *r*, ensures that the driving connection acting on the dial carrying the writing is maintained until such moment when the dial, after having completed a full rotation, entirely reaches the upper side of the table 11 and has been fully covered by the recording marks. Hence, the driving connection with the clock mechanism does not cease until such moment.

The flap *p* of the dial, exerting a guiding action with its front edge *r*, *w* when the dial is rotated, will engage, when a rotation is almost completed, a guiding tongue 18, provided at a partition 19 dividing the interior of the casing 1, said guiding tongue, when the cover is closed, with its free end lying against the surface of the table 11. This will result in the flap *p* of the dial, still continuing its rotation for the time being, running up the

inclined plane formed by the guiding tongue 18. This inclined plane leads to a rear recess 20 of the partition 19, forming, as it were, a collecting chamber for the ends of the flap of the dials bearing completed records. If, after having passed through 360°, such dial is completely writte upon, the flap p will have fully entered the collecting chamber 20 and the last pins 7 or teeth 10, respectively, have ceased to be in engagement with the dial. In that case the dial will remain in this ineffective position ensured by the collecting chamber 20, in which it cannot interfere with the working operation of the next-following dial.

In the described arrangement the consecutive dials are thus guided one after another onto the table top by means of the guiding tongue 16, the following dial directly following the preceding dial, thus ensuring an uninterrupted record covering the totality of the time periods formed by the number of the dials combined in a stack. The sequence of the individual dials and their direct consecutiveness cannot be interferred with in this case, for example, by influences acting from without. The dials will be gradually disengaged according to their displacement by the clock mechanism from the driving teeth 7 and 10, respectively, so that the clock mechanism will not be subjected to sudden stresses. But the principal advantage resides in the fact that the dials can be utilized for the entry of records over their entire range, covering 360°, so that for driving the dials may be used a standard clock mechanism rotating over 360° during 24 hours.

The mode of construction according to Figures 8 to 14 operates on the same principle, differing from the before-mentioned construction in general only by the constructional form of the individual parts.

The dials used, an example of which is represented in Figure 9, show a radial slot r', extending from the edge of the dial up to the inner hole l. The arc-shaped slot part t, existing in the before-mentioned dials, is therefore absent in these dials. There are also no recesses provided at the circumference, corresponding to the recesses v in the mode of construction shown by Figures 2 or 15, respectively. But the dials s' in this case have, instead, within the range of their radial slots more holes u' than on the remaining part of the dial. As disclosed in particular by Figure 11, in this construction the table top 111, covering the clock mechanism and the stack of dials, is provided with a slot 115, through which the edge, understood as the fore edge in the direction of motion, of the dial slot r' may pass. In order to be able to lift the dial within the range of this edge from the dial of the stack underneath and passing it through the slot 115, there is provided also in this mode of construction a guiding tongue 116, which with its free end is placed on the surface of the topmost dial available at the time. Hence, this guiding tongue has the effect that the dial, bent upwardly in its entire width, reaches the surface of the table 111. In this case the inner edge 111a of the table top is formed and chamfered in such a manner that it augments the effect of the guiding tongue 116 and gradually guides it onto the table top 111 according to the rotating movement in the sense of the arrow x. This will result in the holes u' of the dial becoming gradually disengaged from the pins 107 of the carrier plate 106 actuated by the clock mechanism. An elastic lug 111b, provided at the inner edge of the circular table top 111, serves for having the dial remain engaged with the engaging pins 107 up to the last moment, so that proper transfer is ensured during the entire rotating movement of the dial.

This construction differs from the hereinbefore described mode of construction insofar that the collecting element taking up and securing the dials bearing the records, is not firmly arranged in the casing 1 of the apparatus, but is fastened to the table top 111. This collecting element consists of a guiding sheet 118 set-off U-shaped at its end 120 and firmly fastened to the table top 111. In the case of the casing being closed (Figure 14) this collecting element enters a depression 119a of the partition covering the driving mechanism contained in the casing 1. If the cover is opened the collecting element 119, 120 assumes a position permitting its unhindered passing of the recording elements 102 when closing the apparatus. As soon as the front part 120 of the collecting element reaches the partition 119, it bends in such a manner that it will be located behind the recording elements when the apparatus is fully closed. This will ensure that the dial can take up the records over its entire range of 360°.

Apart from these constructional variations the second mode of construction does not fundamentally differ from the first-described mode of construction. The dials rotated by the clock mechanism are guided successively with the aid of the guiding tongue 116 to the table top 111 and thereby under the recording element 102. As soon as a dial has been once rotated by 360° and having been fully written upon, it will be definitely released from the driving engaging pins 107, and with the edge of the slot r', progressing in the sense of rotation, will be taken up into the collecting chamber 120. The collecting chamber will thus have the effect that the dials bearing the recording marks, will be retained in their inoperative position so that they cannot interfere with another registering process.

Instead of making use of the before-described drive of the dials, in which case these dials, as may also be noted from Figure 20, have holes u or u' coacting with corresponding engaging pins, the dial s'', as shown by Figure 19, may be provided with external cogging z, meshing with the internal cogging of a ring driven by the clock mechanism of the apparatus.

An additional possibility of the dial drive is shown by the Figures 17 and 18. In this case the inner hole l of the dial s''' is provided with internal cogging z'. This internal cogging is engaged by a pinion 122 driven by the spindle of the clock mechanism 5 and eccentrically disposed to the axis of the dial and the apparatus. Which of these two driving methods is employed is immaterial. When making use of the before-described characteristic features of the invention it will be possible in all cases to attain the advantages referred to in the beginning.

FRANZ FÖRNBACHER.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

F. FÖRNBACHER
RECORDING SPEED INDICATOR
Filed Aug. 10, 1940

Serial No.
352,111
5 Sheets-Sheet 1

Fig. 2

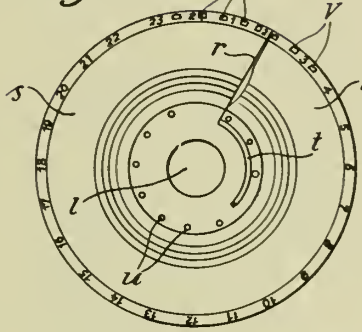
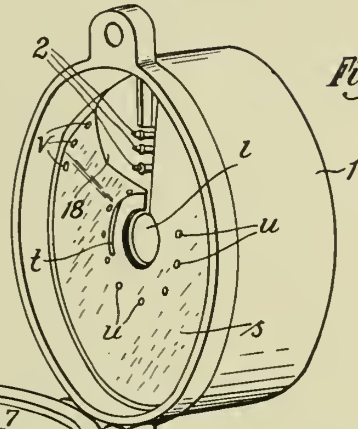


Fig. 1



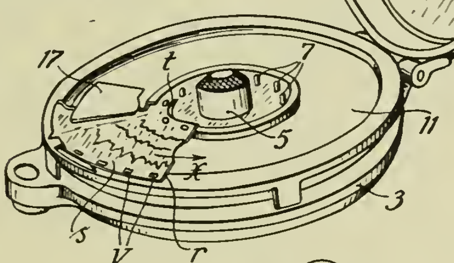
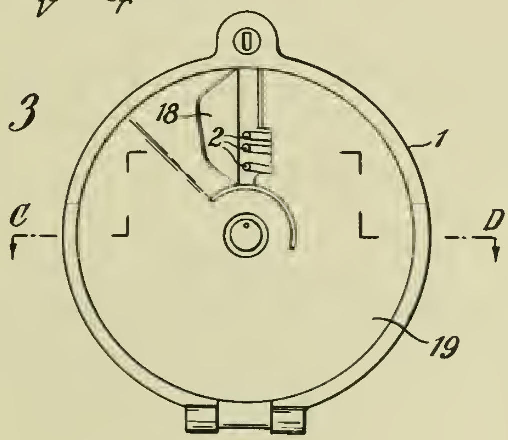


Fig. 3



Inventor:
Franz Förnbacher,

Attorney:
Harold D. Penney.

PUBLISHED	F. FÖRNBACHER	Serial No.
MAY 25, 1943.	RECORDING SPEED INDICATOR	352,111
BY A. P. C.	Filed Aug. 10, 1940	5 Sheets-Sheet 2

Fig. 5

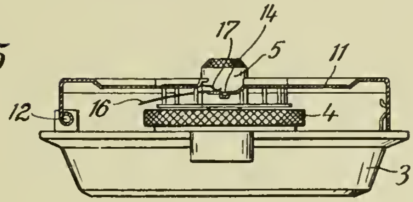


Fig. 6

Fig. 4

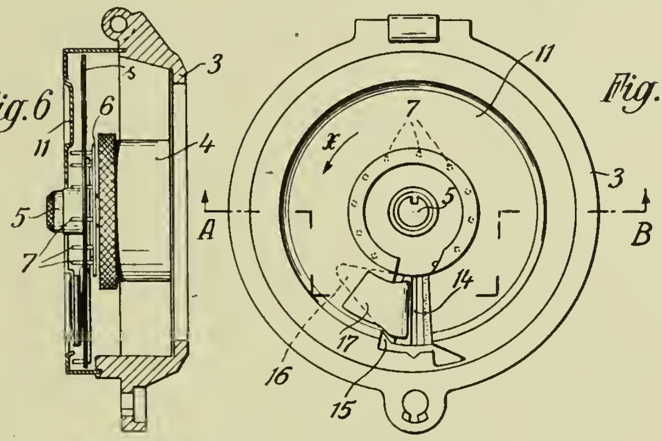
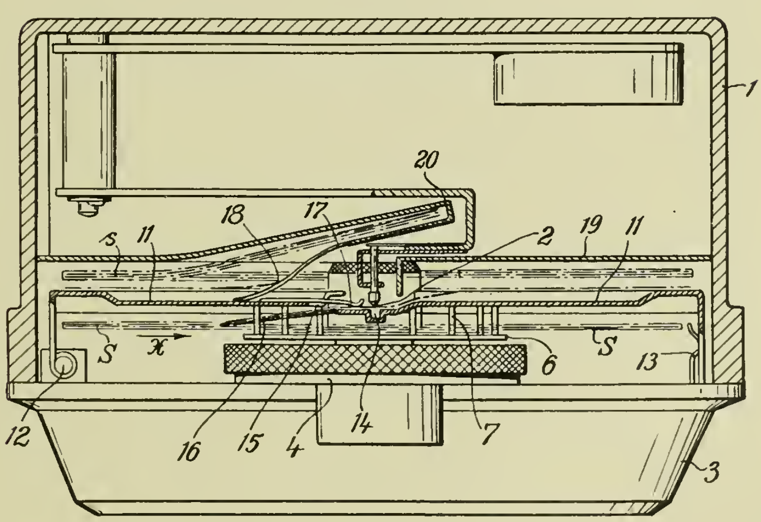


Fig. 7



Inventor:
Franz Förnbacher, Harold D. Penney
Attorney:

PUBLISHED	F. FÖRNBACHER	Serial No.
MAY 25, 1943.	RECORDING SPEED INDICATOR	352,111
BY A. P. C.	Filed Aug. 10, 1940	5 Sheets-Sheet 3

Fig. 9

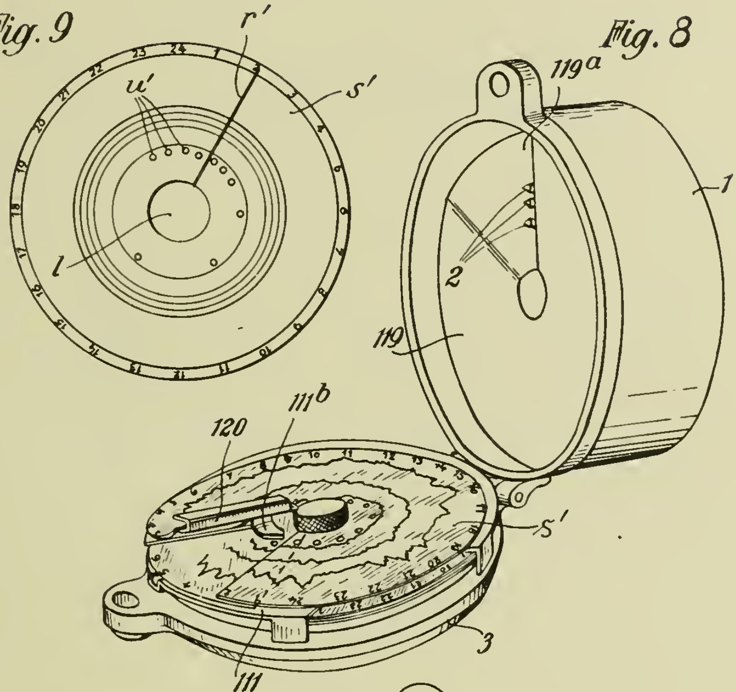
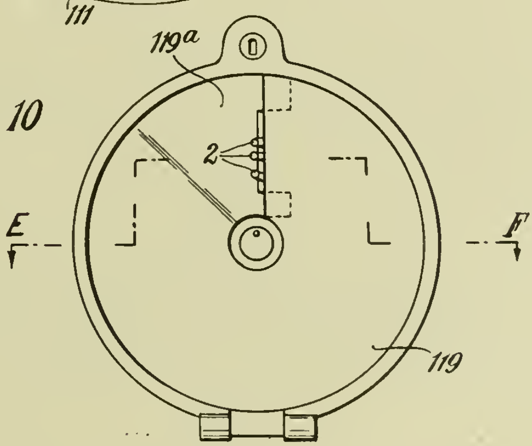


Fig. 8

Fig. 10



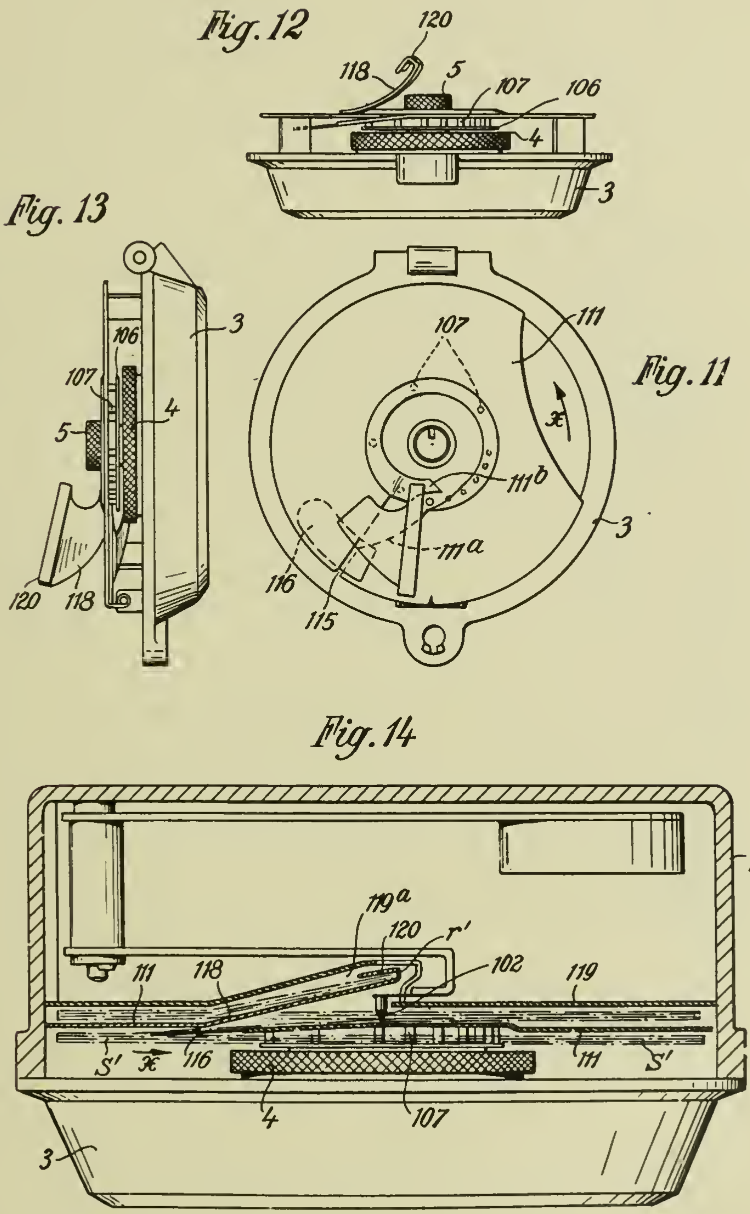
Inventor: Franz Förnbacher,

Attorney: Harold D. Penney.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

F. FÖRNBACHER
RECORDING SPEED INDICATOR
Filed Aug. 10, 1940

Serial No.
352,111
5 Sheets-Sheet 4



Inventor:
Franz Förnbacher.

Attorney:
Harold D. Penney

PUBLISHED
MAY 25, 1943.
BY A. P. C.

F. FÖRNBACHER
RECORDING SPEED INDICATOR
Filed Aug. 10, 1940

Serial No. 352,111
5 Sheets-Sheet 5

Fig. 19

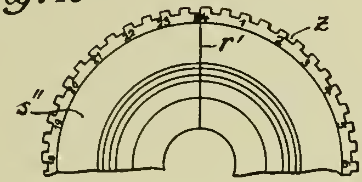


Fig. 20

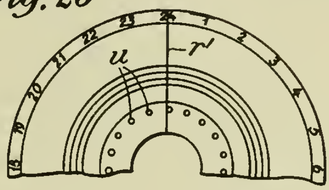


Fig. 17

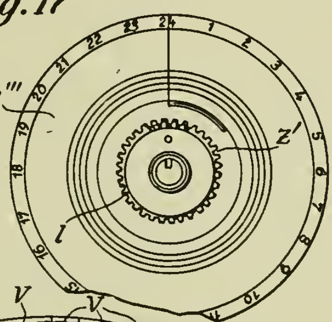


Fig. 18

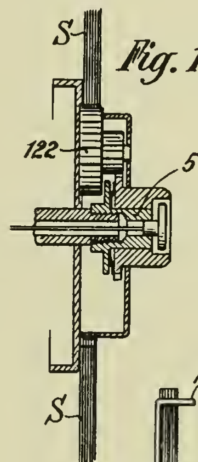


Fig. 15

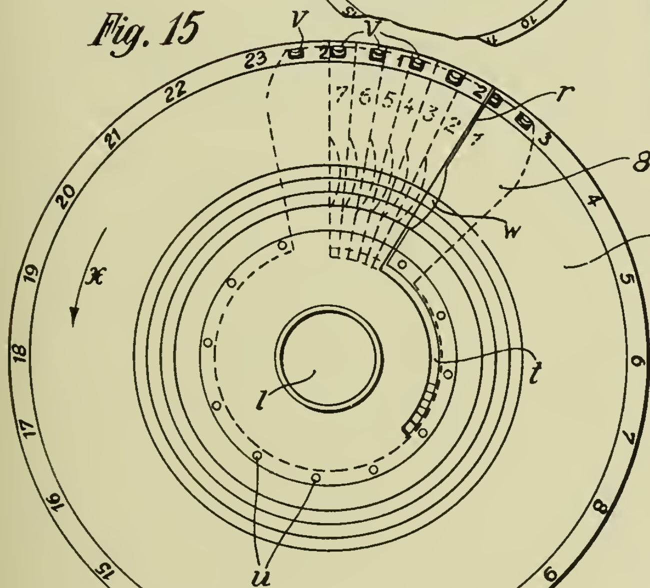
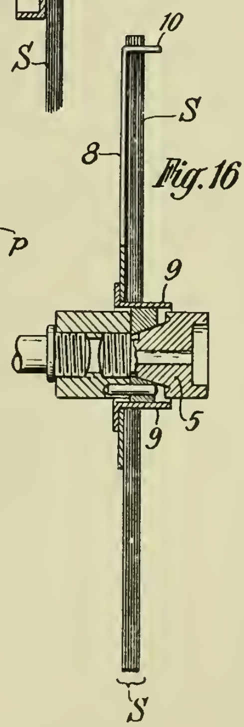


Fig. 16



Inventor:
Franz Förnbacher,
Attorney:
Harold D. Penney

Published May 25, 1943

Serial No. 353,344

ALIEN PROPERTY CUSTODIAN

HEAT EXCHANGE DEVICE OF THE LAMELLATE TYPE

Stefan Beck, Budapest, Hungary; vested in the Alien Property Custodian

Application filed August 20, 1940

It is known that the so-called lamellate-type of heat exchange devices consists of one or more pipes for the distribution of the internal medium (e. g. hot water) and, in case of more distributing pipes, of collecting pipes connecting these distributing pipes and of sets of plates or lamellae parallel to each other and put on the said distributing pipe or pipes. The lamellae are provided with a central hole for their putting on the pipes and are in metallic contact with the pipe along the boundary line of the said hole. The external medium, e. g. air (to be heated or cooled) flows in the spaces between the lamellae situated parallel to each other at an angle to the centre line of the pipe, the flowing of the air taking a direction parallel to the plane of the lamellae. Devices of this kind have the advantage of comprising very large heat exchange surfaces in a relatively small space, along a short length of pipe, but they have from the point of view of the heat transfer the following disadvantage:

The external medium flows along the whole area of the heat exchange surfaces formed by compact lamellae of this kind and is, therefore in contact with them during a relatively long time. On account of this fact particularly of the braking up of the flowing medium, a stagnant heat insulating layer (Prandtl's boundary layer) is formed along the heat exchange surface, which layer adheres to the surfaces, becomes thicker and thicker in the direction of the flow and diminishes the speed of the external medium and decreases therefore the coefficient of heat transfer in a high degree. In view of this fact apertured heat exchange surfaces (for instance wire meshes, perforated or slotted plates) have already been employed which assured great advantages for the heat transfer in certain cases, for instance by an arrangement of the same in the interior of a draught-accelerating box in such a manner that the external medium flows through the apertures. Namely, the external medium, flowing through the holes of the said apertured plates being generally thin and having therefore a very small dimension in the direction of flow of the external medium, is only along a short path in contact with the heat exchange surface and therefore no thicker, disadvantageous heat insulating layer can be formed along the said surface. On the other hand, the average of the utilizable difference of temperature between the surface and the medium, the increasing of which increases likewise considerably the heat transfer, becomes likewise favourable on account of the very short time of contact between the external medium and the surface and also on account of the failure of the said thicker stagnant heat insulating layer having a relatively high temperature, in consequence of which the external medium flows with a relatively high speed in the vicinity of the surface.

When, however, such apertured heat exchange surfaces, known per se, are arranged in the manner of the usual lamellate heat exchange devices, the external medium flows in the spaces between the lamellae likewise along the surfaces i. e. along a path of relatively great length without coming into effect of the said advantages of the apertured surfaces. The invention is based upon the recognition that lamellate heat exchange devices having the advantage of a most compendious arrangement as well as of perfect construction also from the point of view of heat transfer can be obtained in such a way only, when the external medium is forced to flow in a cross direction relative to the lamellae and therefore surely through the apertures. This is obtained according to the invention in composing the surface in such a manner that the lamellae put on the pipes are constituting a continuous surface crossing the direction of flow of the external medium interrupted only by apertures of the lamellae, through which the external medium flows. This may be achieved in accordance with the varying conditions of the manufacture and the required out-put by various shaping or arrangement of the apertured lamellae, namely in forming the cross-section of the sets of lamellae so in order that they correspond to a broken or curved e. g. to a zig-zag-shaped or undulating or meandered line. In these various embodiments, however, it is not necessary that the edges of the ends of the lamellae inclined towards each other and crossing the flow of the external medium should be in contact with or soldered to each other, it being in fact also possible to leave the edges of the lamellae spaced somewhat apart from each other in free position but the clearances resulting from this arrangement should be made in such small width that the distance of the said edges from each other measured on the centre line of the pipe, in order to ensure that external medium does not flow through the apertures between the edges of the lamellae in an appreciable extent but only through the channels between the lamellae or through the apertures of the lamellae.

According to the invention the advantage of the heat exchange devices of the general lamel-

late type consisting in the concentrated arrangement of large heating surfaces in a small space and in a small number of distributing pipes are united with the advantages of apertured heat exchange plates placed in a direction crossing the flow of the external medium and having only a very small dimension in the direction of flow, these advantages consisting in increasing the coefficient of heat transfer in a great extent and diminishing the air resistance. In this manner a heat exchange body of such a great heat transfer and low price originates being constructed in using such a small number of distributing pipes and with respect to the heating effect so much concentrated as has never been obtainable, not even approximately by the heat exchange devices hitherto known.

A particular feature of the device according to the invention, substantially different from the heat exchange devices hitherto used, consists in the fact that the external medium flows in a direction crossing the lamellae as well as the distributing pipes. This feature offers the advantage that it may be ensured, independently from the number of lamellae put on each one pipe, that every particle of the external medium crosses the heat exchange surface only once; in other words, the external medium does not flow through an entire set of lamellae put on each one pipe and therefore any desired number of lamellae can be employed upon a pipe without any drawback of heat transfer, It is all the same in the case in which the external flowing medium should be heated to a higher temperature and for this purpose a multiplied device is used in which the flowing medium crosses the apertured lamellae twice or three times as necessary, but in all events quite independently from the number of the lamellae put on each one of the pipes. The invention possesses the further important advantage that in consequence of the fact that the distance between the distributing pipes as well as between the lamellae can be chosen quite independently from each other, these two dimensions can be defined in each case in the most favourable proportion corresponding to the coefficients of heat transfer of the internal medium flowing in the distributing pipes and of the external medium. Thus, for instance, if the internal medium has a very high heat transfer capacity (e. g. condensing steam) the distributing pipes may be arranged in a wider spaced relation and the lamellae very closely to each other, whereas, if the internal medium has a low heat transfer capacity, e. g. oil the pipes may be arranged closely to each other and the apertured lamellae more distant. This makes a much more extended and exact accommodation to the various conditions possible than that kind of devices provided with apertured heat exchange plates in which the apertured plates are parallel to the centre lines of the distributing pipes and in consequence thereof the proportion between the surfaces of the pipes and the surfaces of the plates can be altered only in varying the width of the plate measured between two pipes.

The accompanying drawing illustrates sketchy some embodiments of the heat exchange device according to the invention by way of example.

Fig. 1 is a perspective view and

Fig. 2 a part cross section of an embodiment comprising a set of lamellae disposed in zig-zag-form.

Fig. 3 is a perspective view and

Fig. 4 a part cross section of an embodiment comprising sets of lamellae disposed according to hexagonal figures.

Fig. 5 is a part cross section of an embodiment comprising likewise sets of lamellae disposed according to hexagonal figures but constructed as a multiple heat exchange device in which the external flowing medium crosses the sets of lamellae several times.

Fig. 6 is a part cross section of a device comprising a set of lamellae of meandered cross section.

In the embodiment according to Fig. 1 and 2 the lamellae **1** having wings apertured by slots **2** and being put on one or more pipes **3** conducting the internal medium, are disposed in zig-zag form. In this manner channels **4** originates between the adjacent lamellae and the external medium is forced to flow through the apertures of the lamellae, transversely to these lamellae. The edges 5 of the ends of the lamellae inclined towards each other may be either in contact with each other, as shown in the upper part of Fig. 2, or a certain small space 6 may be left between the edges 5 as shown in the lower part of Fig. 2 under the conditions described in the preamble.

In the embodiment shown in Fig. 1 and 2 each apertured lamella is crossed only once by the various part currents of the external medium. If all edges 5 are joined without clearances 6, all lamellae to be put on the distributing pipes 3 may be made from a continuous plate.

According to the embodiment shown in Fig. 3 and 4 each pair of adjacent lamellae **1** forms a channel of hexagonal cross section and each one of these pairs of lamellae forms a closed figure and is made from one piece or are left the said clearances 6 between the edges 5 of the lamellae. The adjacent pairs of lamellae can join each other directly or as shown in Fig. 4 under having small spaces 6*a* between them under conditions mentioned in the preamble. As the arrows show in Fig. 4, in this embodiment each part current x_1—x_1 and x_2—x_2 is crossed twice by the same apertured lamella. It is evident that this embodiment has the important advantage that such a double crossing can be obtained by using only a single set of distributing pipes 3.

The device according to Fig. 5 is a multiple one, to be employed for heating the external medium to a higher temperature. In this embodiment part currents of the external medium cross the apertured lamellae. Besides that it is evident that in increasing the number of the superposed sets of lamellae according to the necessity, the number of the said crossings can be increased at will. In this embodiment the lamellae **1***a*, **1***b* joined in zig-zag-shape in the direction of the flow of the external medium and belonging to a plurality of pipes of sets or sets of pipes **3** may also be made from one piece of plate, as shown in the figure.

According to the embodiment shown in Fig. 6 the set of lamellae put on the distributing pipe **3** has a cross section of meandered shape, i. e. the lamellae **1** perpendicular to the pipe 3 are associated with lamella-parts 7, parallel to the pipe 3 and formed either from one or the other of two adjacent lamellae, or the entire set of lamellae may be produced by folding one single continuous sheet. In all embodiments preferably smooth solid strips **8** are left between the apertured portions of the lamellae by which strips the lamellae or sets of lamellae may be easily and firmly put on the distributing pipes **3**. According to a preferred embodiment of the invention these not

PUBLISHED

MAY 25, 1943.

BY A. P. C.

S. BECK

HEAT EXCHANGE DEVICE OF THE LAMELLATE TYPE

Filed Aug. 20, 1940

Serial No.
353,344

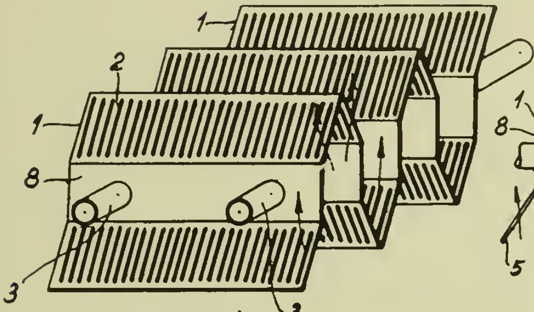


Fig. 1.

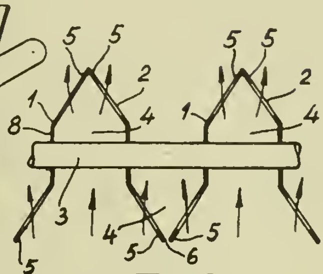


Fig. 2.

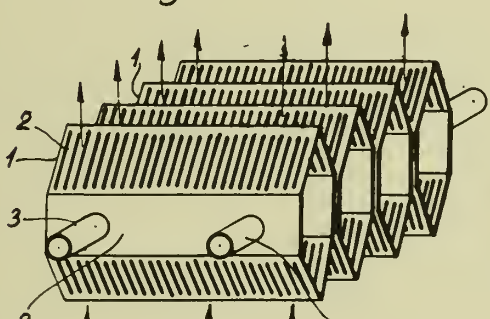


Fig. 3.

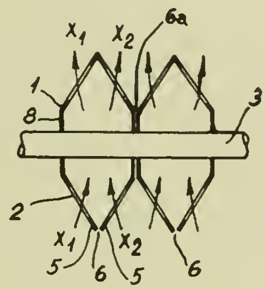


Fig. 4.

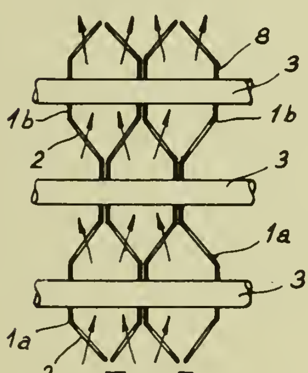


Fig. 5.

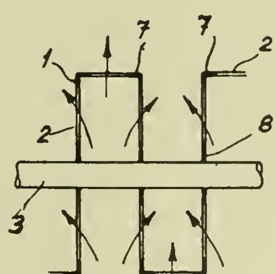


Fig. 6.

INVENTOR:
STEFAN BECK

BY Haseltine, Lake & Co.
ATTORNEYS

Published May 25, 1943 Serial No. 353,551

ALIEN PROPERTY CUSTODIAN

GAS TURBINE

Alfred Schütte, Augsburg, Germany; vested in the Alien Property Custodian

No Drawing. Application filed August 21, 1940

This invention relates to a particularly heat resisting rotor and blades in gas turbines.

To make possible operation of gas turbines at high temperatures special materials, mostly containing greater or lesser amounts of alloying additions, as Ni, Cr, Mo, W, etc., have been developed for rotors and blades. Some of these materials show also additions of Ti, Ta and Nb, but all of them fail to give satisfaction in gas turbines which in continuous operation are capable of withstanding gas temperatures of 700° C and over and of maintaining proper circumferential speeds. In most instances, a temperature of 700° C is not attained, the maximum being 600° C. Furthermore, these materials are open to the objection that the alloying elements are quite expensive.

There are further materials available which disclose excellent creep strength without containing these expensive alloying elements, though temperatures in excess of 600° C are not permissible. They are also not non-scaling at high temperatures. It has been attempted to use ceramic materials for the production of turbine rotors and blades. They possess extraordinary refractoriness and, even at increasing temperature, do not lose strength to the very considerable degree observable in known turbine materials. Considering the problem concerned, it should be borne in mind, however, that a rotor is necessarily weakened by the provision of the grooves required for the reception of the blades, which is particularly serious with respect to ceramic materials in view of the high gas temperature.

According to the invention, the troubles mentioned can be overcome by producing the rotor and the blades in one piece from ceramic masses.

Although it has been tried to make rotor and blades in one piece from steel possessing high creep resistance, no satisfactory results could be obtained owing to the difficult machinability of this kind of steel. Ceramic masses, on the other hand, represent a material which, in addition to disclosing favorable properties at high temperatures, can be readily worked. The masses may be molded or, after having been preparatorily fired at moderate temperature, turned, drilled, milled, etc. and permit grinding after firing has been completed. By using ceramic masses according to the invention the turbine rotor and blade can be made integral and strength can be considerably enhanced without causing troubles for subsequent machining operations.

ALFRED SCHÜTTE.

Published May 25, 1943

Serial No. 353,755

ALIEN PROPERTY CUSTODIAN

HOLLOW SPACE RADIATOR

Walter Dällenbach, Berlin W 35, Germany; vested in the Alien Property Custodian

Application filed August 22, 1940

The invention relates to a device for radiating ultra short waves consisting of several tuned hollow space radiators being built of conducting surfaces.

This invention particularly can be used as sending or receiving aerial for oscillations having a wave length less than 1 m.

One feature of this invention is the tuned hollow space radiator consisting of surrounding conducting surfaces being open at one side, the hollow space being coupled to an energy conducting device or alike by means of a slit in the back wall of said hollow space radiator. Several of such hollow space radiators are being coupled side by side to an energy conducting device or alike for the purpose of improving the directing effect. The distance of these single radiators having a seize of one or a multiple of λ. It is necessary that the single radiators of such a group are being tuned accurately so getting exactly one single frequency supplying the possibly highest effect.

A further feature of this invention is that the single radiator walls can be put directly one close to the other and that they can be coupled electrically through openings of the walls such providing an automatic adjustment of the different radiators. In this way the adjusting of the single radiators by hand being rather difficult and troublesome can be avoided. Furthermore it is not necessary to spend special attention to the exact situation of the slits in the back walls of the single radiators forming the connections to the energy conducting device being put exactly into the loops of the current.

Fig. 1 represents a single hollow space radiator consisting of a boxlike device.

Fig. 2 shows a group radiator consisting of several hollow space radiators put one close to the other and being provided with openings in the side walls.

Fig. 3 illustrates a plan view of a set of hollow space radiators forming a group as said before showing the side walls of the single hollow space radiators being split up into two at the outside such forming pocketlike small cases of a depth of $\lambda/4$.

Fig. 1 represents the hollow space radiators consisting of a box with parallel walls these having conducting surfaces. The side length of the box are signed with *a*, *b* and *c*. The front side of the box is open. The back wall of the box contains a slit **2** being connected with the interior of an energy conducting device **6** said device being fitted with or without an inner conductor. The hollow space radiator thus is coupled with the energy conducting device and is being excited in such way that the electric vector of the oscillations is perpendicular to the walls *bc*. The intensity of the electrical vector is divided sinusoidal as well along the edge *c* as along the edge *b*, as shown in Fig. 1 by the curves *e* and *f*. A box tuned in such a way represents a resonator being equivalent to a Lecher system of a length of $\lambda/4$. In the open front side **1** there is a potential loop whilst there is a potential node in the back wall at the slit **2**. The tuning of the box will not be changed whilst altering the length of the edge *a*.

Fig. 2 represents another special feature of the invention, this being a group radiator, consisting of several single boxes as shown by Fig. 1. This group radiator is showing its edge *a* being very much longer than the other edges *b* and *c*. In this group radiator box several separating and electrical conducting walls **7** are provided parallel to the sides *bc*, thus forming a device of a set of single radiators being built closely together. Every single radiator box in its back wall has a slit **2**, for coupling the box to the energy conducting device **6**. The walls **7** contain openings **9** for providing a radiation of only one wave length. These openings should be particularly placed close to the back walls **8** of the group box. F. i. these openings may be formed semicirclelike, it also may be useful to form these openings **9** rectangularly by leaving off that small piece of a separating wall **7** which is next to the back wall **8**, i. e. the separating wall being not led close up to the back wall. The coupling of the single radiators resulting from these openings **9** in the side walls **7** effects in all boxes equal amplitudes of oscillations also if the excitation of the different slits **2** in the single boxes is not exactly the same. Therefore it is not necessary as said before to place the slits **2** in respect to the energy conducting device mathematically exact into the current loops. In many cases it is quite sufficient that the slits **2** are placed near to currents of equal direction, i. e. having a distance of about λ. In some cases it might be necessary to regulate the coupling of the single radiators and therefore it will be useful to make alterable the openings **9** f. i. like a variable screen. Instead of building only one large box containing separating walls for making a radiator device one also can put together several single boxes each box being meant for one hollow space radiator. The construction as per Fig. 2 has essential advantages.

Fig. 3 schematically shows some improved device as per Fig. 2 thus avoiding even the additional spraying appearing at the edges of the walls. This already is explained in the former application of the applicant Ser. No. 64,604. As per Fig. 3 the edges of the surfaces next to the front side especially the side walls **10** and the separating walls **7** as well as also the covers **12** and the grounds **13** (Fig. 2) are split getting thus pocket-like small cases **11** of a depth of $\lambda/4$. By this at all edges of the front sides the intensity of the current will be exactly zero.

WALTER DÄLLENBACH.

Published May 25, 1943

Serial No. 353,755

ALIEN PROPERTY CUSTODIAN

HOLLOW SPACE RADIATOR

Walter Dällenbach, Berlin W 35, Germany; vested in the Alien Property Custodian

Application filed August 22, 1940

The invention relates to a device for radiating ultra short waves consisting of several tuned hollow space radiators being built of conducting surfaces.

This invention particularly can be used as sending or receiving aerial for oscillations having a wave length less than 1 m.

One feature of this invention is the tuned hollow space radiator consisting of surrounding conducting surfaces being open at one side, the hollow space being coupled to an energy conducting device or alike by means of a slit in the back wall of said hollow space radiator. Several of such hollow space radiators are being coupled side by side to an energy conducting device or alike for the purpose of improving the directing effect. The distance of these single radiators having a seize of one or a multiple of λ. It is necessary that the single radiators of such a group are being tuned accurately so getting exactly one single frequency supplying the possibly highest effect.

A further feature of this invention is that the single radiator walls can be put directly one close to the other and that they can be coupled electrically through openings of the walls such providing an automatic adjustment of the different radiators. In this way the adjusting of the single radiators by hand being rather difficult and troublesome can be avoided. Furthermore it is not necessary to spend special attention to the exact situation of the slits in the back walls of the single radiators forming the connections to the energy conducting device being put exactly into the loops of the current.

Fig. 1 represents a single hollow space radiator consisting of a boxlike device.

Fig. 2 shows a group radiator consisting of several hollow space radiators put one close to the other and being provided with openings in the side walls.

Fig. 3 illustrates a plan view of a set of hollow space radiators forming a group as said before showing the side walls of the single hollow space radiators being split up into two at the outside such forming pocketlike small cases of a depth of $\lambda/4$.

Fig. 1 represents the hollow space radiators consisting of a box with parallel walls these having conducting surfaces. The side length of the box are signed with *a*, *b* and *c*. The front side of the box is open. The back wall of the box contains a slit **2** being connected with the interior of an energy conducting device **6** said device being fitted with or without an inner conductor. The hollow space radiator thus is coupled with the energy conducting device and is being excited in such way that the electric vector of the oscillations is perpendicular to the walls *bc*. The intensity of the electrical vector is divided sinusoidal as well along the edge *c* as along the edge *b*, as shown in Fig. 1 by the curves *e* and *f*. A box tuned in such a way represents a resonator being equivalent to a Lecher system of a length of $\lambda/4$. In the open front side **1** there is a potential loop whilst there is a potential node in the back wall at the slit **2**. The tuning of the box will not be changed whilst altering the length of the edge *a*.

Fig. 2 represents another special feature of the invention, this being a group radiator, consisting of several single boxes as shown by Fig. 1. This group radiator is showing its edge *a* being very much longer than the other edges *b* and *c*. In this group radiator box several separating and electrical conducting walls **7** are provided parallel to the sides *bc*, thus forming a device of a set of single radiators being built closely together. Every single radiator box in its back wall has a slit **2**, for coupling the box to the energy conducting device **6**. The walls **7** contain openings **9** for providing a radiation of only one wave length. These openings should be particularly placed close to the back walls **8** of the group box. F. i. these openings may be formed semicircle-like, it also may be useful to form these openings **9** rectangularly by leaving off that small piece of a separating wall **7** which is next to the back wall **8**, i. e. the separating wall being not led close up to the back wall. The coupling of the single radiators resulting from these openings **9** in the side walls **7** effects in all boxes equal amplitudes of oscillations also if the excitation of the different slits **2** in the single boxes is not exactly the same. Therefore it is not necessary as said before to place the slits **2** in respect to the energy conducting device mathematically exact into the current loops. In many cases it is quite sufficient that the slits **2** are placed near to currents of equal direction, i. e. having a distance of about λ. In some cases it might be necessary to regulate the coupling of the single radiators and therefore it will be useful to make alterable the openings **9** f. i. like a variable screen. Instead of building only one large box containing separating walls for making a radiator device one also can put together several single boxes each box being meant for one hollow space radiator. The construction as per Fig. 2 has essential advantages.

Fig. 3 schematically shows some improved device as per Fig. 2 thus avoiding even the additional spraying appearing at the edges of the walls. This already is explained in the former application of the applicant Ser. No. 64,604. As per Fig. 3 the edges of the surfaces next to the front side especially the side walls **10** and the separating walls **7** as well as also the covers **12** and the grounds **13** (Fig. 2) are split getting thus pocket-like small cases **11** of a depth of $\lambda/4$. By this at all edges of the front sides the intensity of the current will be exactly zero.

WALTER DÄLLENBACH.

PUBLISHED	W. DÄLLENBACH	Serial No.
MAY 25, 1943.	HOLLOW SPACE RADIATOR	353,755
BY A. P. C.	Filed Aug. 22, 1940	

Fig. 1.

Fig. 2.

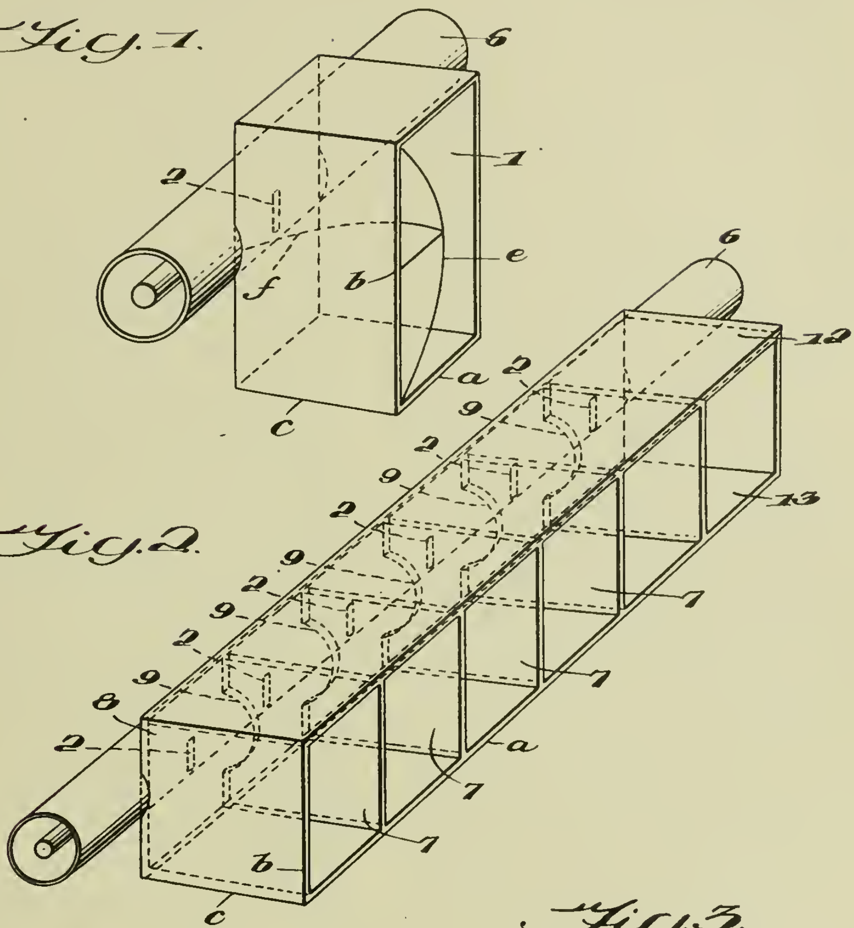
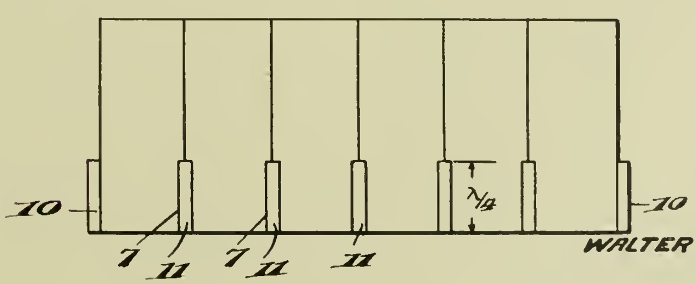


Fig. 3.



Inventor

WALTER DÄLLENBACH,

By Bailey & Larson

Attorney

Published May 25, 1943

Serial No. 353,408

ALIEN PROPERTY CUSTODIAN

CALCULATING OR BOOKKEEPING MACHINES

Walter Höszler, Chemnitz, and Albert Lohs, Siegmar-Schonau, Germany; vested in the Alien Property Custodian

Application filed August 20, 1940

The invention relates to a calculating or bookkeeping machine with full key-board with splitable printing mechanism and with an adding and subtracting totalizer and with several accumulators arranged on a common carrier, said accumulators being successively brought into the operative position in dependence on the movement of the paper carriage, various functions of which machine are automatically set up by control elements provided on the paper carriage.

The invention has for its object to construct such a machine in such a manner that it is possible to book in two lines the one typed under the other and to accumulate twice the number of accumulator totals as corresponds to the number of accumulators, this accumulation rendered possible by splitting of the printing mechanism, while at the same time it is possible to automatically perform different kinds of work in one line than in the other line by carriage control. Thus it is possible to employ a narrower form and therefore a shorter paper carriage. According to the invention this is attained in that the key-board of the machine is sub-divided into two sections and the keys of the one section act upon linkages controlled from the paper carriage in such a manner that the controls of the various functions effected from the paper carriage are rendered either effective or ineffective.

An embodiment of the invention is illustrated by way of example in the accompanying drawings in which

Fig. 1 shows a longitudinal section through a bookkeeping machine on section line **1**—**1** of Fig. 4,

Fig. 2 is a section on line **2**—**2** of Fig. 4,

Fig. 3 shows in side elevation details of the carriage control,

Fig. 4 is a cross-section through the bookkeeping machine on section line **4**—**4** of Fig. 1,

Fig. 5 is a cross-section through the bookkeeping machine on section line **5**—**5** of Fig. 1,

Fig. 6 shows in top plan view, partly in section the front portion of the bookkeeping machine,

Fig. 7 shows a detail of the subtraction control,

Fig. 8 shows a booking form for wages account filled with postings on the machine.

In Fig. 1 the digit keys, of which twelve rows are provided in this form of construction, are designated by **1**. Each digit key **1** has at the lower end of its stem **1a** a slide **2** which has two rectangularly bent-off portions **3** and **4**. The left side of the bent-off portion **3** forms an inclined face **11**, as shown in Fig. 4, and has a recess **5** in the middle. A locking bar **7** fixed on a square-shaft **6** cooperates with the bent-off portion **3**, said locking bar being pivoted about the shaft **6** which is journalled at **8** and **9**. The locking bar **7** has in its lower edge as many portions **10** bent off at right angles as there are digit keys in one row.

If a digit key is depressed the inclined face **11** presses upon the corresponding bent-off portion **10** and thereby rocks the locking bar **7**. At the end of the descending movement of the digit key the bent-off portion **10** engages into the recess **5**, so that the key is securely held in the depressed position. If a digit key **1** has been depressed erroneously, it can be released by depressing the correct key. When the correct key is depressed the locking bar is rocked so much, that the bent-off portion **10** is moved out of the recess **5** of the erroneously depressed digit key so that this key can jump upwards to its inoperative position under the action of a spring not shown, the correct digit key being securely held in its operative position by the locking bar **7**.

In order to maintain the locking of the depressed digit keys **1** during a machine operation and to thus prevent depression of other keys or alteration of the values indicated by the depressed keys, the following arrangement is made:

The pivot points **8** and **9** of the shafts **6** which carry the locking bars **7** are provided in a rectangular frame **12** which encloses all slides **2** of the key-board and consists of the elements **13**, **14** carrying the pivot points **8** and **9** and of the side plates **15**. On each side plate **15** two levers **16**, **17** are hinged, which are pivotally mounted in the machine frame **20** at the points **18** and **19**, so that the frame **12** can be shifted from the position in Fig. 1 to the left and back to the right. A spring, which is not shown, pulls the frame **12** to the right against a stop also not shown; this is the position shown in Fig. 1. At the beginning of every operation of the machine the frame **12** is moved against the action of the spring not shown to the left, relative to Fig. 1, by such a distance that the bent-off portions **10** of the locking bars **7** come into the range of pins **21** fixed on the keyslides **2**. The frame **12** remains in this position almost to the end of the machine operation, in order to be then returned to its ineffective position by the action of the spring. If the frame **12** is in its effective left hand position, it is not possible to depress a key, as the pins **21** are held by the bent-off portions **10** of the locking bars **7** and the digit keys are thus prevented to carry out a downward movement. By this arrangement

it is attained, that during a machine operation any actuation or releasing of the keys is impossible.

Stepped bars 22, which in known manner cooperate with the key-slides 2 and serve for feeling off the numeral values corresponding to the depressed keys 1 in that the steps 61 on the stepped bars 22, at their movement to the left relative to the position in Fig. 1, strike against the bent-off portions 4 of the depressed keys 1, are hingedly mounted at 23 on toothed segments 24 which are oscillatably mounted on an shaft 25. Springs 26 tend to rotate the toothed segments 24 in clockwise direction. This movement is posible only if an abutment rod 28, fixed on two levers 27 which are rigidly fixed on the shaft 25 at the sides of all toothed segments 24 and are turned at the beginning of every operation of the machine in clockwise direction and at the end of every operation of the machine in anti-clockwise direction, liberates the toothed segments 24 when the levers 27 swing in clockwise direction.

Each square-shaft 6 has at the right hand end in Fig. 1 a plate 20*a* extending perpendicularly to the locking bars 7 fixed on the shafts 6, said plate having a hole 21*a* in its end remote from the shaft 6. The shouldered end 22*a* of the rod 23*a* engages into this hole 21*a*. The rod 23*a* is hinged at 24*a* to a three-armed lever 26*a* pivotable about a pin 25*a*, said lever being held by a spring 27*a* in the position shown in Fig. 1. A bent-off portion 28*a* of the three-armed lever 26*a* allows movement of the stepped bar 7 only until the projection 29*a* strikes against it. If a digit key 1 is depressed, the corresponding locking bar 7 is rocked as mentioned above. At this rocking movement the plate 20*a* presses against the shoulder of the rod 23*a* whereby the three-armed lever 26*a* is turned in anti-clockwise direction. After the corresponding bent-off portion 10 of the locking bar 7 has engaged into the recess 5 of the depressed key 1, the three-armed lever 26*a* is held in a position in which its bent-off portion 28*a* is no longer in the path of the projection 29*a* of the stepped bar 22. As soon as a digit key 1 is depressed, the corresponding stepped bar 22 is released so that during the operation of the machine feeling off of the numeral value corresponding to the depressed key 1 is possible.

Toothed sectors 29 are pivotally mounted on the shaft 25 each sector being connected by a spring 30 with the corresponding toothed segment 24. The spring 30 has the tendency to bring into contact with a pin 32 fixed on the toothed segment 24 the right hand edge of a recess 31, relative to Fig. 1, in the toothed sector 29. The toothed segments 24 are held in their inoperative position on the one hand by a fixed rod 33 extending over all toothed segments 24 and on the other hand by the abutment rod 28. The spring 30 therefore tends to rotate the toothed sector 29 in anticlockwise direction. This rotation is prevented by a locking element 36, which at its downward movement engages with its lower end between a stationary stop 34 and a pin 35 fixed on the toothed sector 29. This locking element is hinged on a two-armed lever 37 which is pivotally mounted in the machine frame at 38. A spring 39 tends to turn this lever 37 in clockwise direction. This turning movement is prevented thereby that a bent-off portion 40 of a ten's carry pawl 42 pivotable about a pin 41 engages in front of a shoulder 43 of the lever 37. The ten's carry pawl 42 is secured in this position by a spring 44.

The ten's carry pawls 42 have at their lower end each two projections 45 and 46 cooperating with the ten's carrying cams 47 and 48 of the corresponding toothed wheels 49 and 50 of the adding and subtracting totalizer. If a set of wheels of this totalizer is in mesh with the toothed sectors 29 and if a ten's carrying cam 47 or 48 encounters a projection 45 or 46 at entering an amount into the totalizer, the ten's carry pawl 42 is rocked in clockwise direction about the fulcrum 41 against the action of the spring 44. The bent-off portion 40 of the ten's carry pawl 42 is thereby disengaged from the shoulder 43 of the lever 37. The lever 37 can then carry out, under the action of the spring 39, a movement in clockwise direction, the bent-off portion 40 of the ten's carry pawl 42 coming into engagement with the shoulder 51 of the lever 37. At the same time when the lever 37 is moved in clockwise direction, the locking piece 36 is lifted and the toothed sector 29 is thus liberated for a further turning movement in anticlockwise direction under the action of the spring 30. When the toothed sector 29 is moved in anticlockwise direction until the pin 35 strikes against the projection 52 of the locking piece 36, a unit is transmitted at the same time into the next higher ordinal place of the adding and subtracting totaliser 49, 50.

Type carriers 53 mesh with the toothed segments 24 and have types 54 at their upper end. During the operation of the machine, the type carriers 53 are lifted by the toothed segments 24 such a distance and such types 54 are brought into printing position, as correspond to the values of the depressed digit keys. This upward movement is limited by the stepped bars 22 hingedly mounted at 23 on the toothed segments 24, the steps 61 of these bars striking against the bent-off portions 4 of the key-slides 2. As soon as the type carriers 53 have arrived at the printing position, hammers 55 are released and flung under the action of springs 56 against the types 54, so that on the paper sheet guided over the platen 57 the amount according to the depressed keys is printed. When a type carrier 53 is raised in accordance with the numeral "9" its projection 58 comes to rest against the abutment 59.

Each type carrier 53 is connected at its lower end with a rack 62 by a pin and slot connection 63, 64. Springs 65 tend to bring the pin 64 to rest against the upper end of slot 63 and to move the rack 62 in downward direction by a unit. The rack 62 is prevented from participating in this movement as a bent-off portion 68 of the ten's carry pawl 67 is in the path of a projection 66 of the rack. This locking position is shown in Fig. 1. If the ten's carry pawl 67 is rocked in anti-clockwise direction about its fulcrum 67*a*, the bent-off portion 68 of rack 62 liberates the rack 62 to carry out a carrying movement in downward direction corresponding to a unit. When the rack 62 moves downwards by one tooth, the value 1 is added into the accumulator 78 in the corresponding ordinal place. The ten's carry pawl 67 has on its lower arm a projection 69, on which the ten's carrying cam of the corresponding toothed wheel of the accumulator 78, which is in engagement, can act so that the ten's carry pawl 67 is rocked in the above described manner in anti-clockwise direction. In this rocked position the ten's carry pawl 67 is held on the bent-off portion 71 by the shoulder

70 of a lever 72 turnable about the bolt 73. The upper arm of the ten's carry pawl 67, in the position in which it locks the rack 62, is forced by a spring 74 against a rod 75 and the bent-off portion 71 then engages with the shoulder 76 of the lever 72. The lever 72 is pressed against the bent-off portion 71 of the ten's carry pawl 67 by the action of a spring 77.

The accumulators 78, of which sixteen are provided in the bookkeeping machine described, are arranged in a drum rotatable about a shaft 80. The accumulator drum consists of two plates 79 arranged at a distance corresponding to the width of the accumulators 78 and having flap-like extensions 81. Each one of these extensions 81 has a bore 81a, and in these bores accumulator frames 82 are turnably mounted, so that the accumulators 78 mounted at 83 in the frames 82 can be brought into engagement with the racks 62 by means not shown.

Each of the sixteen accumulators 78 arranged in the accumulator drum can be brought separately into operative position by controlling the rotary movement of the drum from the paper carriage; therefore the device hereinafter described is provided:

A disc 84 arranged on the accumulator drum has steps 85 which are spirally arranged and cooperate with a stop 86. This stop 86 is fixed on a slidable piece 87 which, by means of a spindle 88, can be shifted in vertical direction in a guide 89. The spindle 88 is driven from a shaft 92 by means of toothed wheels 90, 91. A pinion 93 having five teeth is rigidly fixed on the upper end of shaft 92 and can be turned by one tooth by each control member 95 when the paper carriage 94 moves. The control members 95 are arranged on a bar 96 removably fixed on the paper carriage 94. If the paper carriage 94 jumps from one column-position to the other column-position, the pinion 93 is turned by means of a control member 95 by one tooth and the sliding piece 87 with the stop 86 is lifted so high that the next following step 85 comes to rest against the stop 86. If the accumulator drum is in this position, the corresponding accumulator 78 is brought into mesh with the racks 62 in the following operation of the machine.

In the machine described the key-board is subdivided into two equal sections and the printing mechanism of the machine is split accordingly. In a similar manner the adding and subtracting totalizer and the sixteen accumulators are subdivided each one into two sections, so that thirty-two totals can be accumulated in the machine. In the calcultaing mechanisms at the places corresponding to the line of subdivision between the two sections of the key-board, ten's carrying can be prevented.

The following arrangement is made for preventing ten's carrying:

A hand operated lever 97 is pivotably mounted at 98 in the machine frame and has a horizontal arm 99. This horizontal arm 99 acts, when the hand lever 97 is turned in clockwise direction to the position shown in Fig. 1 upon the arm of a two-armed lever 100 pivotable about a bolt 101, said arm extending forward from the plane of the drawing, so that the rear arm of lever 100 pulls to the left relative to Fig. 1 a rod 102 hingedly connected with this rear arm. The right hand end of rod 102 is hingedly connected with a lever 103, which lever with its left lower end 105, constructed as abutment, acts upon a bent-off portion 104 of the lever 37. If, therefore, the hand lever 97 is turned in clockwise direction, the lower end 105 of the lever 103 presses on the bent-off portion 104 of the lever 37 and brings this lever 37 into the position shown in Fig. 1. The lower end of the locking piece 36 hingedly mounted on the lever 37 is thus brought in between the stationary abutment rod 34 and the pin 35 fixed on the toothed sector 29, so that this toothed sector is prevented from moving in anti-clockwise direction under the action of the spring 30. In this manner a ten's carrying at the places corresponding to the line of subdivision between the two key-board sections is prevented.

A rod 107 is hingedly mounted on the lower arm 106 of the hand lever 97 and the lower end of this rod 107 is turnably fixed on a lever 108 rigidly mounted on a bolt 109. The lever 110, also fixed on bolt 109, is hingedly connected by means of a bolt 111 with a slide 112. A slot 114 in mesh with bolt 113 serves for guiding the slide 112. The slide 112 consists of two plates 115 and of an intermediate plate 116, which has a rectangular recess 117 and an oblique face 118. If the hand lever 97 is brought to the position shown in Fig. 1, the rod 107 fixed on the lower arm 106 of the hand lever 97 swings the lever 108 and with the same also the lever 110 in clockwise direction, so that the slide 112 is shifted to the left relative to Fig. 1. The recess 117 of the plate 116 comes then underneath the lower end of the rack 62 guided between the two plates 115. The rack 62 is in this manner securely held in its position shown in Fig. 1 a ten's carrying being prevented.

By turning the hand lever 97 to the position shown in Fig. 1 a ten's carrying is prevented in the described manner as well in the adding and subtracting totalizer as in the accumulator which is in operative position.

For controlling the method of calculation of the totalizer, i. e. addition or subtraction, a lever 119 pivoting about a point 120 is provided, which is pulled by a spring 121 to its position shown in Fig. 2, this position corresponding to the addition position of the adding and subtracting totalizer. If the lever 119 is shifted in clockwise direction, the adding and subtracting totalizer is set for "subtraction". The lever 119 can be automatically shifted by paper carriage control. The following arrangement is provided therefor: A recess 123 in a link 124 engages a pin 122 fixed on the lever 119 and is held in this position by the action of a spring 125. The link 124 is hingedly fixed on a bellcrank 125a which pivots about a stationary bolt 126 and is connected by a resilient link 127 with a lever 128 rigidly connected with a stationary bolt 129. A one-armed lever 130 is rigidly fixed on the bolt 129 and its end projects into a recess in a two-armed lever 132 pivotable about a stationary bolt 131 as shown in Fig. 7. The other end of the two-armed lever 132 carries a roller 133 on which control members 134 can act which are mounted on a bar 135. The bar 135 is fixed on the shiftable paper carriage 94. If at the movement of the paper carriage 94 a control member 134 passes along the roller 133, the two-armed lever is rocked in anti-clockwise direction as shown in Fig. 7, so that the rod 124 is shifted through the elements 130, 128, 129, 127, 126, 125 towards the right relative to Fig. 1 and the subtraction lever 119 is brought to its position corresponding to the subtraction position of the adding and subtracting totalizer.

For setting the machine for non-addition (NA) of the totalizer a key 136 is provided, which is

connected with a lever 138 pivotable about a pin 139. This key 136 may also be actuated from the paper carriage and herefor the following arrangement is made as shown in Fig. 3:

A three-armed lever 141, pivotably mounted on a stationary pin 140, rests against a pin 142 projecting from the stem of the key 136. The lower arm of the three-armed lever 141 is connected with a rod 143 which is hingedly connected to a lever 145 loosely mounted on a shaft 144. A bellcrank 147, 148 is further pivotably mounted on the shaft 144 and rocked in clockwise direction when a control member 149 on a bar 150 fixed on the paper carriage 94 strikes against it, said bellcrank carrying along the lever 145, by means of a spring 146 connecting the arm 147 and the lever 145, and brings by means of rod 143 and the three-armed lever 141 the NA key into its active position.

The printing mechanism of the machine may be blocked in that the edges 152 and 153 of a shaft 151 are brought into the path of the extensions 154 of the printing hammers 55. Shaft 151 is cut out in the range of those type carriers which are used for date printing, only for one half, whereas in the range of the type carriers which effect the printing of the numerals it is cut out up to the edge 153. In the position of the cut out shaft 151 shown in Fig. 1 the printing hammers which effect the date printing are prevented by the edge 152 from moving in anti-clockwise direction, whereas those printing hammers, which effect the printing of the numerals, are liberated, as the edge 153 is not in the path of the extensions 154 of these printing hammers 155. The shaft 151 is connected with a link 156 by means of a crank 153 rigidly fixed on the shaft, this link 156 being hingedly connected with a three-armed lever 157 pivotably mounted at 158. A spring 159 tends to turn the three-armed lever 157 in anti-clockwise direction in order to thereby liberate the printing hammers for the date printing.

In order to automatically take the total from the totalizer 49, 50 a crank 161 is connected with the shaft 160 which is in connection with the total-lever of the totalizer, said crank adapted to be actuated from the paper carriage. Herefor a control member 163 is mounted on a bar 162, fixed on the paper carriage 94, said control member being adapted to act upon a roller 164 of a bellcrank 165, 166. The arm 166 of this lever is connected, by means of a link 167, with a bellcrank 168, 169. The horizontal arm 169 of this bellcrank has a bent-off portion 170 which engages behind a projection 171 of a slide 172 shiftably guided on pins 174, 175 by means of slots 176, 177. A spring 173 holds the bellcrank 168, 169 in the position shown in Fig. 2. The right hand upper end of slide 172 cooperates with a pin 178 mounted on the crank 161. A spring 179 tends to shift the slide 172 towards the right relative to Fig. 2, but is prevented from doing this by the bent-off portion 170 of the bellcrank 168, 169. The fork-shaped end 180 of a bellcrank 182 pivotably mounted at 181 is in mesh with the pin 178 of crank 161; the right hand end of the bellcrank 182 is connected with a link not shown which at the rocking of the bellcrank 182 in clockwise direction initiates a machine operation. If therefore the roller 164 of the bellcrank 165, 166 is rocked by a control member 163, the bellcrank 168, 169 is then rocked by means of link 167 in anti-clockwise direction, so that the bent-off portion 170 releases the slide 172. This slide 172 turns under the action of spring 176, when it moves to the right, the crank 161 and the bellcrank 182 in clockwise direction whereby the machine is set to total taking and at the same time a machine operation is initiated. In this manner a total taking from the totalizer 49, 50 is effected automatically.

The idle stroke being necessary before the automatic total taking operation is initiated automatically by a cam 183 provided on the accumulator drum 79 in the following manner: During the movement of the accumulator drum 79 the cam 183 moves along a bent-off portion 184 of a lever 186 pivotably mounted at 185, rocking the lever 186 in clockwise direction, whereby, by means of a link 187 fixed on the lever 186 and of a link 198, a lever 188 pivotable about 189 is rocked in anti-clockwise direction, and thereby a machine operation is initiated.

The initiating of a machine operation can be effected also from the paper carriage, and with this object in view control members 190 are provided on the paper carriage which can cooperate with a roller 192 fixed on a lever 191. The lever 191 pivotable about 193 is connected by means of a link 194 with the lever 188 so that, when a control member 190 runs against the roller 192, the lever 188 is rocked in anti-clockwise direction and an operation of the machine is initiated thereby.

A machine operation can also be initiated by a crank 196 turnably mounted at 195 and connected with the lever 188 by means of a link 198. The crank 196 is connected with the total-key 197 of the accumulators so that, when this key 197 is depressed, the crank 196 is moved in clockwise direction and thus a machine operation is initiated.

The control of certain functions from the paper carriage can be rendered ineffective by lockings which at the operation of the keys of the right section of the key-board can be unlocked again. The following devices are provided herefor:

A hand lever 199 and a crank 199*a* are fixed on a shaft 203 as shown in Fig. 3. A pawl 200 pivotably mounted on the shaft 203 and connected with the crank 199*a* is pressed, by a spring 201*a*, against a pin 200*a* of the crank 199*a*. In the normal position of the hand lever 199 shown in Fig. 3 the lower end of pawl 200 rests against a pin 201 of triangular shape fixed on the three-armed lever 141, so that movement of this three-armed lever 141 in clockwise direction is prevented. If a control member 149 strikes against the bellcrank 147, 148, the bellcrank 147, 148 is rocked in clockwise direction but cannot draw along the lever 145 as the three-armed lever 141 is locked. In this manner actuation of the NA-key from the paper carriage is rendered impossible. If the hand lever 199 is pulled by the action of a spring 202 in clockwise direction about its pivot 203, as shown in Fig. 2, its pawl 200 moves away from pin 201 as shown in Fig. 3 so that, when the bellcrank 147, 148 is actuated by a control member 149, the NA-key 136 is depressed.

On the shaft 203 of hand lever 199 a crank 204 is rigidly fixed, the pin 205 of this crank lifts, when the hand lever 199 is pulled in clockwise direction, the link 124 and brings the recess 123 of this link out of engagement with the pin 122. In this manner the automatic control of the subtraction lever 119 effected from the paper carriage is eliminated.

When a key of the right hand section of the key-board which has for instance six rows of digit keys is depressed, the inclined face 11 presses

on the bent-off portion 13 of the corresponding locking bar 7 and this locking bar is rocked in clockwise direction. By this rocking movement a rod 208 having abutment rings 207 is shifted to the right by a plate 206 fixed on the locking bar 7. The plates 206 are provided only on those locking bars which belong to the right section of the key-board. The right hand end of the rod 208 acts upon a lever 210. The shaft 209 of lever 210 is carried in a frame 211, which is pivotable about a shaft 212. If the frame 211 is rocked in anti-clockwise direction by the rod 208 and the lever 210, a lever 213 rigidly fixed on frame 211 engages under the right hand end of a lever 215 pivotable about a pin 214 and rotates this lever in anti-clockwise direction, so that a shoulder 217 on the arm 216 of the lever 215, which is the front arm relative to Fig. 2 and controlled by a spring 248, moves away from a square-pin 218 arranged on the hand lever 199, so that this hand lever 199 is moved by the action of spring 202 in anti-clockwise direction and comes in engagement with a second shoulder 219 of the arm 216. By this movement of the hand lever 199 on the one hand the right hand end of link 124 is brought by the crank 204 out of engagement with the pin 122 of the subtraction lever 119 and on the other hand the non-adding set up by paper carriage control is released. At the same time the liberating of the date printing takes place, in that at the movement of the hand lever 199 in clockwise direction a crank 220 rigidly connected with the hand lever 199 is moved and thereby a spring 221 is detented which connects the crank 220 and a lever 222, the pin 223 of which cooperates with the three-armed lever 157, so that this three-armed lever is liberated for a movement in anti-clockwise direction under the action of the spring 159.

If the effects obtained by depressing of keys of the right hand key-board section have to be cancelled, the depressed keys must first be released, the hand lever 199 brought to its position shown in Figs. 2 and 3 and the subtraction lever shifted to the right relative to Fig. 2, in order that in case in the corresponding column position a subtraction control member had rocked the link 124 towards the right relative to Fig. 2, the notch 123 of this link 124 is brought in engagement with the pin 122 of the subtraction lever 119, finally the three-armed lever which, at the running on of the bellcrank 147, 148, has been turned in clockwise direction must be returned to its initial position shown in Fig. 3. Before the three-armed lever 141 is brought to its initial position, its triangular pin 201 is within the recess 200*b* of the pawl 200, so that when the three-armed lever 141 is turned in anti-clockwise direction, the triangular pin pushes away the pawl 200 rotating the same in clockwise direction by a small angular amount against the action of spring 201*a*. After this rotating movement the pawl 200 and the three-armed lever 141 are in the position shown in Fig. 3. To this position the three-armed lever 141 is brought by the action of hand lever 146*a*, rotatable about 147*a*. The left lower arm of the hand lever 146*a* acts upon a pin 145*a* arranged on a lever 143. A spring 144*a* tends to turn in anti-clockwise direction the lever 143*a* pivotable about 142*a*. If the lever 146 is turned in anti-clockwise direction, the left end of the lever 144 engages under the pin 141*a* of the three-armed lever 141 and swings this lever in anti-clockwise direction to its initial position shown in Fig. 3.

The action upon the lever 210 effected by keys of the right hand key-board section can be rendered ineffective by a rod actuated by paper carriage control, so that it is possible, to depress the keys of the right hand section of the key-board without obtaining thereby the above described effects. With this object in view the lever 210 is connected with a rod 224, which is hinged on a bellcrank 226, 227 pivotably mounted at 225. The roller 228 arranged on the left arm 227 can cooperate with control members 229 fixed on the bar 162 so that, when a control member 229 runs against the roller 228, the bellcrank is rocked in anti-clockwise direction and thereby the lever 210 turned in clockwise direction and its lower arm swung out of the range of rod 208.

The returning of the hand lever 199 to its initial position shown in Fig. 2 is effected at the end of a machine operation by a disc 231 mounted on the main shaft 230 of the machine. At the forward stroke of each machine operation the disc 231 is turned in clockwise direction and at the rearward stroke of each machine operation it is turned in anti-clockwise direction. Let us suppose the square-pin 218 of the hand lever 199 be in engagement with the shoulder 219 of the arm 216. If then at the forward stroke of the machine operation disc 231 is turned in clockwise direction, the pin 232 moves without effect along the pass-by pawl 234 which pivots on a lever 235 fixed at 233, the upper fork-shaped end of this lever being in mesh with a pin 236 on the lower end of the hand lever 199, the pawl 234 being pivotable on the pin 238 only in anti-clockwise direction against the action of the spring 237. At the same time a pin 240 mounted on an arm 239 fixed on the disc 231 liberates a pawl 241 pivotable about 247, so that the nose 243 of this pawl, under the action of a spring 242, comes to rest against the upper edge of the square-pin 218. If slide 172 has been shifted to the right under the action of the spring 179 in one of the preceding machine operations, this slide 172 is brought, by the extension 244 of disc 231 cooperating with the pin 245 of slide 172 towards the left to its position shown in Fig. 2. At the rearward stroke of the main shaft 230 of the machine the pawl 234 with lever 235 is rocked in clockwise direction by the pin 232 fixed on the disc 231 to such a distance that the recess 246 of pawl 241 comes into engagement with the square-pin 218 of hand lever 199. In this position the square-pin 218 does not yet bear against the shoulder 217 of the arm 216. The square-pin 218 bears against shoulder 217 only if at the end of the rearward stroke the pin 240 lifts the pawl 241 in clockwise direction and thereby liberates the hand lever 199 for a small movement in clockwise direction. The pawl 241 is necessary in order to hold the hand lever 199 in its shifted position after the instantaneous shifting of the hand lever 199 in anti-clockwise direction, as it may happen that the shoulder 217 of arm 216 does not come instantaneously into engagement with pin 218, so that if pawl 241 were not provided the hand lever 199 would be returned again in clockwise direction under the action of the spring 202 and the square-pin 218 would come into engagement with shoulder 219.

In order that from the two accumulator- and totalizer-sections the totals can be taken separately a device manually controlled is provided which locks during a total taking operation selectively either the one or the other differential mechanism corresponding to a key-board section.

For engaging the locking device, two handles 249 and 250 are provided, which are fixed on locking slides 251 and 252 respectively as shown in Figs 1 and 6. The locking slide 251, which is the left relative to Fig. 6, is guided on pins 257 and 258 by means of slots 253, 254 and the right hand slide 252 is guided on pins 259, 260 by means of slots 255 and 256. The pins 257, 258, 259 and 260 are fixed on a bar 261 which is guided on pins 262, 263, 264 and 265 arranged on the locking frame 12 by means of slots 266, 267, 268 and 269, said bar being shifted at the setting of the total-lever of the totalizer or of the total-key of the accumulators for total taking, towards the left relative to Fig. 6, held in this position during the machine operation, and jumping back into the initial position shown in Fig. 6 under the action of a spring 270 at the end of the machine operation. The locking slides 251, 252 are securely held in their position adjusted by hand relative to the bar 261 by springs 271 and 272 cooperating with projections 273 and 274. The extensions 275 of the locking slides 251 and 252 co-operate during a total taking operation with the vertical arms 276 of the zero pawls 26*a* in the following manner:

If the left hand locking slide 251 is shifted to the left relative to Fig. 6 by means of the hand lever 249, the right hand slide 252 being, however, left in the position shown in Fig. 6, a shifting to the left of both locking slides 251, 252 will be effected by bar 261 if the machine is set for total taking, the extensions 275 of the left slide 251 coming into the range of the zero levers 26*a*, the extensions 277 of the right locking slide 252 remaining, however, out of the range of the zero levers 26*a*. After the bar 261 has been shifted to the left relative to Fig. 6, at the beginning of the machine operation the locking frame 12 is moved to the left relative to Fig. 1 to its locking position. At this movement the extension 275 of the locking slide 251 which are in the range of the zero levers 26*a* strike against the vertical arms 276 of the zero levers 26*a* and swing these in anti-clockwise direction, so that their bent-off portions 28*a* liberate the step bars 22. In this position the zero levers 26*a* are held until, at the end of the machine operation, the locking frame 12 jumps back again to its ineffective position; whereas during this machine operation the left section of the differential mechanism is liberated, the right section of the differential mechanism is locked by the zero levers 26*a* remaining in the locking position shown in Fig. 1. In this instance only the totals can be taken from the left sections of the accumulators and of the totalizer.

If the totals have to be taken from the right hand sections of the accumulators or of the totalizer, the handle 250 must be shifted to the left relative to Fig. 6, in order that its extensions 277 at the shifting of the bar 261 towards the left by means of the total-lever of the totalizer or by means of the total-key of the accumulators come into the range of the zero levers 26*a* and the zero levers 26*a* of the right hand section of the key-board are swung to their ineffective positions when the locking frame 12 is shifted to its locking position.

For such cases in which the machine is not splitted in two sections and therefore totals are to be taken over the full capacity of the totalizer or of the accumulators, a locking slide 278 extending over the whole key-board is provided, said locking slide, when the total-lever of the totalizer or the total-key of the accumulators is actuated, being shifted to the left relative to Fig. 1 so that its extensions corresponding in number to the number of digit key rows are brought into the range of the vertical arms 276 of the zero levers 26*a*. During the machine operation all three-armed levers 26*a* are swung in anti-clockwise direction and thereby all stepped bars 22 and toothed sectors 29 or racks 62 respectively are liberated for feeling off all toothed wheels of the totalizer or of the accumulator 78 being in mesh. In this manner the total can be taken from the full totalizer or accumulator.

The manner of operating the machine will now be explained on hand of a booking form for wages account on which various postings are printed by the machine as shown in Fig. 8.

Be it supposed that lever 97 is in the position shown in Fig. 1, in which the ten's carrying is interrupted between the two sections of the key-board, further the printing mechanism is split accordingly, the lever 199 brought into the position shown in Fig. 2, the hand lever 146*a* shifted in anti-clockwise direction for re-engaging the three-armed lever 141 and the subtracting lever 119 is turned in clockwise direction in order to couple the link 124 with the subtracting lever, in case the notch 123 of this link 124 be out of engagement with the pin 122 of the subtracting lever 119 and to thereby enable the control of the subtracting lever 118 from the paper carriage.

The amounts according to the keys depressed in the right hand section of the key-board are printed in the upper line, those according to the keys depressed in the left hand section of the key-board are printed in the lower line. As by actuation of keys of the right hand section of the key-board the automatic controlling of the kind of calculating of the totalizer set up by the paper carriage is made ineffective, the positive amounts are printed in the upper line, that is in this instance the items which together form the gross wages. In the lower line positive and negative amounts are printed, as at the action of the left hand section of the key-board the control of the kind of calculating of the totalizer is effected from the paper carriage. The amounts set by the keys depressed in the right hand section of the key-board, which are printed in columns 3 to 18, are entered at the same time into the right hand section of the totalizer as well as into the right hand section of one of the accumulators. The amounts of the keys depressed in the left hand section of the key-board are entered into the left hand section of the totalizer and at the same time into the left hand section of one of the accumulators. The individual columns of the booking form are arranged so that the printing mechanism, that is the mechanism for printing numbers and the date printing mechanism, extends over three columns. As in the upper line only those amounts are printed which have been set on the right hand section of the key-board, only the right hand section of the printing mechanism and the date printing mechanism are operative during the posting in the upper line, the date printing mechanism, however, only in such a column position in which a corresponding control member is provided.

If in the first column position the keys for the number of days are depressed in the right hand section of the key-board, the control of the kind of calculation of the totalizer from the paper carriage is made ineffective, the totalizer consequently remains in addition position and the control of the non-addition of the totalizer and

of the date printing from the paper carriage are effective. As in this column position not only a control member for non-addition of the totalizer but also a control member for non-addition of the accumulators is set, the number of the days is entered neither into the totalizer nor into the accumulator, but only printed in the column 2. The paper carriage then jumps automatically to the second column position in which the number of hours is entered into the right hand section of the first accumulator provided herefor and printed in the column 3, the date being printed at the same time in column 1. The number of the hours is not entered into the totalizer, as in this column position a NA-control member for the totalizer is provided. After the paper carriage has jumped to the next column position, the keys for the rate of wages are depressed and this item is printed during a next following machine operation by the right hand section of the printing mechanism and at the same time entered into the right hand section of the second accumulator. As in this column position also a NA-control member for the totalizer is set, also the rate of wages is not entered into the totalizer. The amount (column 5) set up by depression of keys in the next following column position is calculated into the right hand section of the totalizer and at the same time into the right hand section of the third accumulator. The amounts to be printed in the columns 6, 8, 10 and 12 are entered, owing to corresponding NA-control members, only into the right hand section of each corresponding accumulator, whereas the amounts to be printed in the columns 7, 9, 11, 13, 14, 15, 16, and 17 are calculated at the same time into the right hand section of the totalizer and into the right hand section of the corresponding accumulator. After the amount "1.00" has been printed in the position of the paper carriage corresponding to the column 17, the paper carriage jumps to an intermediate position in front of the last column position in which the accumulator drum is rotated by one step and thereby the sixteenth accumulator is brought in operative position. At this drum rotation the cam 183 arranged on the frame 82 of the sixteenth accumulator 18 initiates in the manner above described the idle stroke necessary before each total taking. After termination of this machine operation the paper carriage jumps to its last column position, the slide 172 being liberated by means of a control member 163 for setting the machine for total taking and initiating a machine operation, so that in this column position a total taking is automatically effected from the totalizer. At the same time the total taken from the totalizer is entered into the right hand section of the sixteenth accumulator.

Directly following on the total taking machine operation the paper carriage is automatically returned to the first column position, the platen being at the same time spaced up on line. In this initial position of the paper carriage the total taken from the right hand section of the totalizer must be set up on the left hand section of the key-board and during the next machine operation it is entered into the left hand section of the totalizer and at the same time printed in the column 1 of the lower line by means of the left section of the printing mechanism. As the left hand section of the key-board does not influence the control of the kind of calculation of the totalizer effected by the paper carriage, the kind of calculation is determined from the paper carriage at the booking in the lower line in each column position. In the form of construction shown by way of example a subtraction control member is provided extending over the columns 2 to 15, so that in these columns 2 to 15 the totalizer is set from the paper carriage for subtraction. The keys of the left hand section of the key-board are without influence upon the arrangements for locking the date printing and the non-addition of the totalizer, so that when the left hand section of the key-board is used date printing and non-addition remain inefficient, even though on the paper carriage corresponding control members are provided for the booking in the upper line. The amounts posted in the lower line in the columns 2 to 15 are entered into the left hand section of a corresponding accumulator as well as subtractively into the left hand section of the totalizer. In the sixteenth column the computed amount is additively entered into the left hand section of the totalizer and at the same time into the left hand section of the corresponding accumulator. The paper carriage then jumps to the already mentioned intermediate position, in which the accumulator drum is rotated by one step and the sixteenth accumulator is brought in operative position. By this rotation of the accumulator drum an idle stroke of the machine is initiated again by means of the cam 183. The paper carriage then jumps to its last column position, in which a total taking operation is initiated automatically in the above described manner. At this machine operation the total is taken from the left hand section of the totalizer and this amount entered into the left hand section of the sixteenth accumulator.

In order to take the thirty-two totals accumulated in the accumulators, the locking slides 275, 277 have to be adjusted by means of the levers 249, 250 in such a manner, that the one section of the differential mechanism is locked and the other section is liberated. If the totals have to be taken from the right hand sections of the accumulators, the right hand locking slide 252 has to be moved to the left and the left hand locking slide has to be moved to the right relative to Fig. 6, in order that the extensions 277 of the right hand slide 252 come within the range of the zero levers of the right hand section of the key-board during the shifting of bar 261 to the left relative to Fig. 6 at the actuation of the accumulator total key 197, so that then the corresponding stepped bars 22 and the toothed sectors 29 or the racks 62 are liberated for feeling off the respective sections of the accumulators. After the totals have been taken from the right hand sections of the sixteen accumulators and printed successively in one line, the paper carriage is returned automatically to the first column position, line spacing of the platen taking place at the same time. The right hand slide 252 is then moved to the right and the left hand slide 251 to the left relative to Fig. 6, so that at actuation of the total-key 197 which may also initiate a machine operation the totals are taken from the left hand sections of the accumulators and successively printed in a second line.

Although at the actuation of a key of the right hand section of the key-board the control rods to be controlled or adapted to be adjusted from the paper carriage are uncoupled from the lever 119 for adjusting the kind of calculation of the totalizer, the lever 119 automatically moving into its additive position, an amount to be printed in a column of the upper line can be introduced also

subtractively into the right hand section of the totalizer. Let it be assumed, that in the column 15 of the upper line, instead of a credit amount, an amount has to be printed which represents any deduction and has to be entered subtractively into the totalizer. If a key of the right hand section of the key-board is depressed in this column position, the control of the kind of calculation of the totalizer from the paper carriage is rendered ineffective and the totalizer is set for addition, whereas the amount set by depression of keys has to be entered subtractively into the totalizer corresponding to the debit. For this reason a control member 229 must be provided in this column position to prevent the right hand section of the key-board from acting upon the control of the kind of calculation of the totalizer. If such a control member has been put on, the control of the kind of calculation of the totalizer is effected from the paper carriage by a subtraction control member 134 arranged in this column position on the paper carriage, which otherwise would become effective only at posting of the second line of the form, the left hand section of the key-board being actuated. As, however, in the preceding position of the paper carriage corresponding to column 14 the control of the kind of calculation of the totalizer from the paper carriage has been rendered ineffective and as in this column position a subtraction control member is provided, the notch 123 of link 124 is in a position corresponding to the subtraction position of the subtraction lever 119, whereas the subtraction lever 119 itself is held by the spring 121 in additive position. Consequently, at the end of the machine operation performed in the fourteenth column position the notch 123 of the link 124 comes, by returning the lever 199 to its position shown in Fig. 2, not into engagement with the pin 122 of the subtraction lever 119. A coupling of the link 124 with the subtraction lever 119 must, however, take place as in the position of the paper carriage corresponding to the column 15 the control of the kind of calculation of the totalizer from the paper carriage must be effective again. With this object in view such a gap is provided between the subtraction control member in the position corresponding to the column 14 and the subtraction control member in the position of the paper carriage corresponding to column 15, that the link 124 comes for a moment only into the position shown in Fig. 2, in which its notch 123 engages with the pin 122 of the subtraction lever 119. In this manner the amount set up on the right hand section of the key-board corresponding to the position of the paper carriage corresponding to the column 15 is entered into the right hand section of the corresponding accumulator and at the same time subtractively into the right hand section of the totalizer.

The above described arrangement controllable by the lever 97 for the interruption of the ten's carrying is necessary for such instances, in which an error of calculation has to be corrected by introduction of the complementary value. In such a case without the interruption of the ten's carrying a "one" would be carried over into the lowest ordinal place of the left hand section of the totalizer, if a calculation error is corrected on the right hand section of the key-board. In this manner the result of an accumulator total, obtained by calculation on the left hand section of the key-board, would be wrong by the amount "1". If the lever 97 is brought into the position shown in Fig. 1, the carrying over of a one into the lowest ordinal place of the left hand sections of the accumulators and the totalizer is prevented.

The booking machine described may be used, besides for booking with split printing mechanism in double-lined booking forms, for instance for wages accounts, also for the normal booking in one line. With this object in view the following readjustings have to be carried out on the machine.

The lever 97, which interrupts in the above described manner the ten's carrying, is shifted in anti-clockwise direction from the position shown in Fig. 1, in which a pin 97*a* arranged on it engages in a recess 98*b* of a pawl 98*a*, so that then the pin 97*a* is in engagement with a notch 98*c* of the pawl 98*a*. By this shifting of the lever 97 the ten's carrying is again rendered effective. In this manner it is made possible to enter an amount into all ordinal places of the accumulators and of the totalizer, whereby use can be made of the full capacity of the machine.

Further the device for splitting the printing mechanism is rendered ineffective.

In order to render ineffective the action of the right hand section of the key-board upon the control of the kind of calculation of the totalizer from the paper carriage, the rod 224 is shifted to the left relative to Fig. 2 by means of a lever not shown and held in this position, so that lever 210 is turned in anti-clockwise direction and thereby brought out of the range of action of the rod 203.

After the readjustments mentioned herebefore have been carried out, the machine may be used in known manner for booking amounts requiring the whole width of the key-board.

In the booking machine described further provision has been made for the possibility to lock the slide 172 effecting the automatic taking of a total from the totalizer by a locking knob 279 adapted to be actuated by hand, so that slide 172, even though its projection 171 is released by the bent-off portion 170 of the bellcrank 168, 169 cannot be shifted to the right relative to Fig. 2 by the action of spring 179. As a shifting of slide 172 is prevented by the locking knob 279, automatic total taking will consequently not take place in the last column position of the paper carriage, even though a corresponding control member is provided on the paper carriage.

WALTER HÖSZLER.
ALBERT LOHS.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. HÖSZLER ET AL
CALCULATING OR BOOKKEEPING MACHINES
Filed Aug. 20, 1940

Serial No.
353,408
4 Sheets-Sheet 1

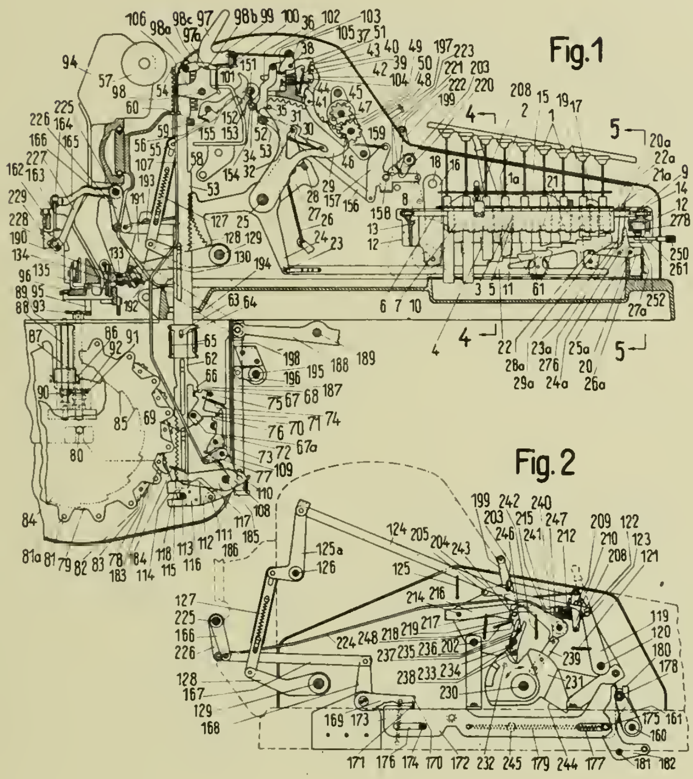


Fig.1

Fig. 2

Inventors:
Walter Höszler and
Albert Lohs
By
Young, Emery & Thompson
Attorneys

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. HÖSZLER ET AL

CALCULATING OR BOOKKEEPING MACHINES

Filed Aug. 20, 1940

Serial No.
353,408
4 Sheets-Sheet 2

Fig. 3

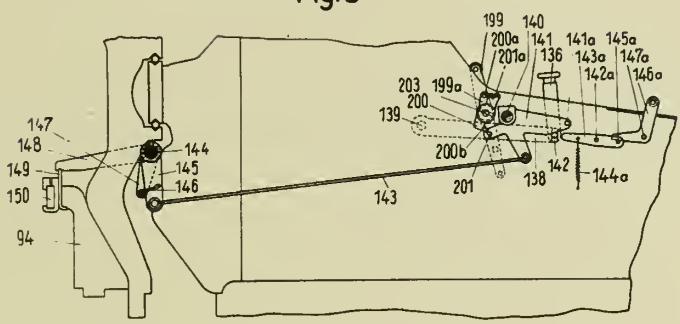
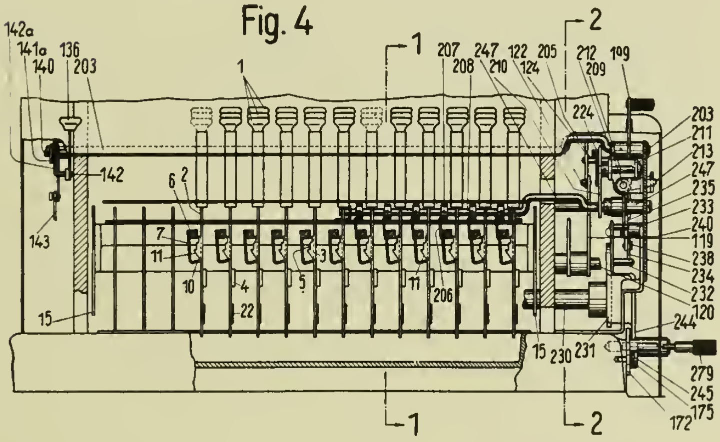


Fig. 4



Inventors:
Walter Höszler and
Albert Lohs
By Young, Emery + Thompson
Attorneys

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. HÖSZLER ET AL
CALCULATING OR BOOKKEEPING MACHINES
Filed Aug. 20, 1940

Serial No.
353,408
4 Sheets-Sheet 3

Fig. 5

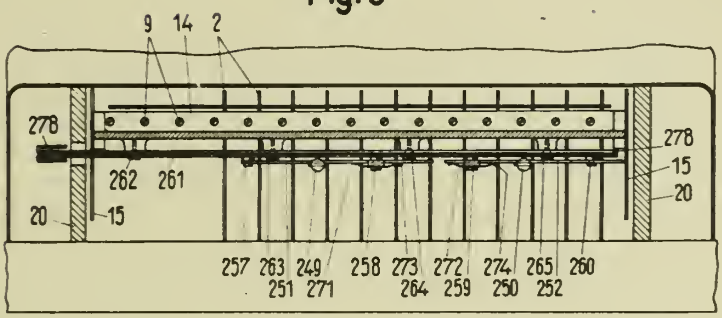


Fig. 6

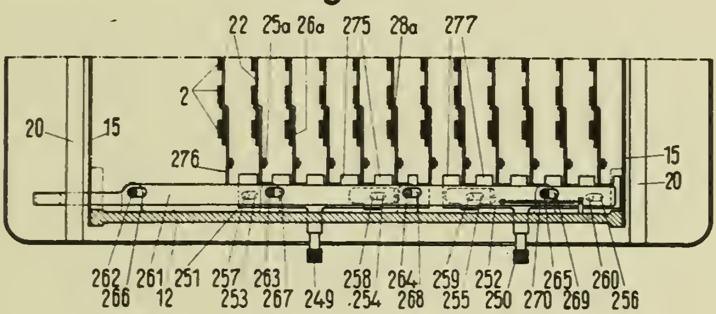
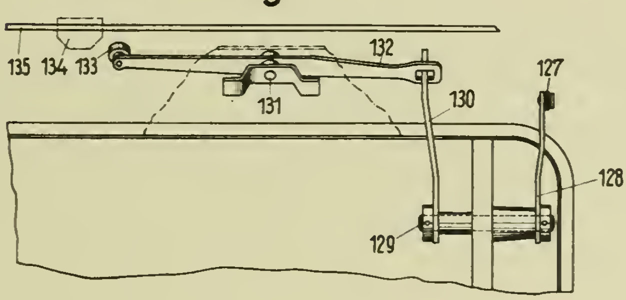


Fig. 7



Inventors:
Walter Höszler and
Albert Loks
By
Young, Emery & Thompson
Attorneys

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. HÖSZLER ET AL
CALCULATING OR BOOKKEEPING MACHINES
Filed Aug. 20, 1940

Serial No. 353,408
4 Sheets-Sheet 4

Fig.8

	1	2	3	4	5
	Date	Days	Hours	rate of wages	Amount
FRED MILLER	1938 Mar. 4	24	102,00	0,80	81,60
	Gross wages	Tax on wages	Additional tax I	Additional tax II	Sick fund
№ 10347	109,40	3,40	1,50	1,70	1,60

6	7	8	9	10	11
Overtime 125 %	Amount	Overtime 150 %	Amount	Additional Hours 125 %	Amount
3	3,00	2	2,40	4	4,00
Insurance I	Insurance II	Union tax I	Union tax II	Union tax III	Advance
1,50	1,50	1,20	1,50	1,30	10,00

12	13	14	15	16	17	18
Additional Hours 150 %	Amount	Premium	Bonification	Holidayfund	Support	Gross wages
2	2,40	3,00	2,00	10,00	1,00	109,40
Rent	Other deductions	Abatement	Carried forward farthings	Surplus farthings	Net wages	
5,00	4,00	1,00	,14	,34	74,00	

Inventors:
Walter Hoszler and
Albert Lohs
By
Young, Emery & Thompson
Attorneys

Published May 25, 1943

Serial No. 354,449

ALIEN PROPERTY CUSTODIAN

CONTROL DEVICE FOR ONCE-THROUGH VAPOR GENERATORS

Ferdinand Riedel, Berlin-Mariendorf, Germany; vested in the Alien Property Custodian

Application filed August 27, 1940

This invention relates to vapor generators of the forced passage type, and more particularly to means for controlling the operation of such vapor generators.

Vapor generators of the forced passage type comprise a once-through vapor passage receiving liquid at one end and delivering superheated vapor at the other end.

In a generator of the forced passage type—in distinction from any other generator type—the evaporation zone is liable to be displaced due to any change in the generator load, it being understood that a decrease results in a displacement of the evaporation zone in the direction toward the superheater section or the output end of the passage, whereby the length of the superheater section will be changed and the temperature of the consumption vapor varied accordingly.

For this reason a previous proposal has been made to provide means for preventing the evaporation zone from undergoing any displacement in the passage.

The present invention is based on the perception that the uncontrolled displacement of the evaporation zone is adapted to be used for controlling the operation of the generator by displacing the evaporation zone at will in accordance with the operating condition of the generator, more particularly in accordance with the generator load.

Such a positive displacement of the zone of evaporation may be advantageous both in the sense of a displacement toward the output end and toward the input end of the passage upon a load increase. The former would be desirable if it is essential to maintain constant the temperature of the delivered superheated vapor whilst the latter would be preferable to enhance the storing capacity of the generator.

In order to more fully explain the subject matter of the invention and its aims and objects reference is had to the accompanying drawing in which

Fig. 1 is a diagrammatic view of a vapor generator of the forced passage type provided with a controlling device according to my invention, and

Figs. 2 and 3 show a reversing device as more fully explained below.

The vapor generator in the usual manner comprises a once-through fluid passage **1** communicating at the input end with a supply conduit **2** supplied by means of a pump **3** and provided with a controlling valve **4** for varying the supply in response to the generator load. To the output end of the passage **1** is connected a main or consumption conduit **5** leading to a consumption apparatus (not shown). A pressure impulse conduit **6** branches off from this conduit **5**, the pressure in said impulse conduit varying as a function of the generator load and therefore being adapted to be used as a load impulse for controlling the supply control valve **4**. A bellows **7** is acted upon by the pressure in the conduit **6** for controlling a lever **8** swingably mounted at **9** and provided with a counterweight **10**. Upon a load increase the weight **10** rocks the lever **8** in clockwise manner so that the jet pipe **11** of a well known Askania jet pipe relay deflects to the left thereby increasing the pressure below the piston of a servo-motor **12** operatively connected to the valve **4**. Accordingly the valve **4** will be further opened and the flow of the supply and the quantity of feed water correspondingly increased in response to the increase of the generator load. A restriction **13** in the conduit **2** is provided for deriving a feed water quantity impulse acting upon a diaphragm **14** for exerting a restoring action on the jet pipe **11** by means of a well known counter-lever **15** and a ratio slide **16**. The increase of the feed water flow due to the opening of the valve **4** results in an increase in pressure on the left side of the diaphragm **14** which leads to an increase in the counter-force restoring the jet pipe **11** to its middle or neutral position shown in Fig. 1.

The water supplied by the conduit **2** to the passage **1** is preheated in the first section thereof and evaporates in the second section. In the range of the evaporation zone **17** a pressure impulse conduit **18** branches off and leads to a bellows **19** for controlling a valve **20** in the main or consumption conduit **5**, this valve being arranged beyond the point of communication **21** of the pressure conduit **6** above referred to. The bellows **19** controls a jet pipe **22** by means of a lever system similar to that shown and described in connection with the bellows **7**. The jet pipe **22** controls a servo-motor **23**, the piston of which is operatively connected to the valve **20** and controls this valve in such a manner that the pressure in the passage at **17**, i. e. the evaporation pressure, remains substantially constant. Be it assumed that due to a load increase the pressure at **17** decreases, then the jet pipe **22** will deflect to the left and the piston of the servo-motor **23** will move downwardly thereby further closing the valve **20**, so that the pressure at **17** is again increased until the predetermined pres-

sure value to be maintained constant is obtained. This predetermined pressure value is represented by a counter-spring **24** acting on the jet pipe **22**. Any variation in the initial tension of the spring results in a corresponding variation in the pressure at **17** in the passage.

In the embodiment shown means are provided for likewise controlling the fuel supply in response to the generator. An electric motor **25** is coupled with a conveyor **26** of a well known pulverizer system and with a measuring fan **27** producing in a conduit **28** a pressure varying in response to the fuel feed. For controlling the fuel feed the motor **25** will be controlled by means of a rheostat **29** inserted in the motor circuit (not shown.)

For varying the part of the rheostat inserted in the motor circuit, a servo-motor **30** is provided controlled by means of a jet pipe relay **31** together with a bellows **32** acted upon by the pressure in a pressure impulse conduit **33** communicating with the main or consumption conduit **5** as at **34**, i. e. beyond the valve **20**. Upon a load increase the pressure in the conduit **33** decreases so that the jet pipe **31** deflects to the left and displaces the piston of the servo-motor **30** to the right, thereby decreasing the resistance of the rheostat **29** and increasing the speed of the motor **25**. Accordingly the pressure in the conduit **28** increases so that the pressure on the left side of the diaphragm **35** increases and exerts a restoring action on the jet pipe **31** similar to the diaphragm **14** acting on the jet pipe **11**.

Beyond the point **17** in the passage a temperature sensitive member **36** is provided for controlling by means of a relay **37** (the details of which are more fully explained below) a servo-motor **38**, the piston of which is connected to a cam **39** for displacing the well known ratio slide **40**, by means of which the transmission ratio between **32** and **35** may be varied in a manner well known to any one familiar with the Askania jet pipe relay. The influence exerted by the temperature sensitive member **36** upon the fuel supply control in dependence on the generator load serves to correct that control for maintaining constant the temperature at **36** in the passage at any generator load.

This temperature has a predetermined relation to the pressure at **17**. By maintaining constant the pressure at **17** in the evaporation zone, i. e. in the zone of saturated vapor, the temperature at this point will be likewise maintained constant and therefore the temperature at **36** should be higher by an amount corresponding to the superheating of the vapor flow from **17** to **36**.

Now by maintaining constant the pressure at **17** in the manner described above and by likewise maintaining constant a higher temperature at **36** the evaporation zone is prevented from undergoing any displacement in the passage for the following reason: If, for instance, the evaporation zone is displaced in direction toward the output end, the temperature at **36** will decrease due to the shortening of the superheating path up to **36**. Therefore the servo-motor **38** increases the fuel supply to the generator by means of the slide valve **40** until the temperature at **36** again rises to its predetermined value, which is the case as soon as the evaporation zone returns to **17**.

As stated above, the initial tension of the spring **24** acting upon the jet pipe **22** represents the value of the pressure to be maintained constant at **17**. Accordingly the pressure at **17** may be adjusted by varying the tension of the spring **24**.

In accordance with the present invention means are provided for varying the tension of the spring **24** so as to displace at will the evaporation zone in response to any operating condition of the generator. In the embodiment shown, the tension of the spring **24** is varied in accordance with the generator load. To this end a bellows **41** is acted upon by the control pressure in the conduit **33**, a branch conduit **42** leading from **33** to **41**. A jet pipe **43** actuated by the bellows **41** controls a servo-motor **44**, the piston of which carries a cam **45**, upon which the spring **24** rests.

This arrangement operates as follows: At a load increase, the impulse pressure in **33**, **42** and **41** is reduced, consequently the jet pipe **43** is deflected to the left and the piston of the servo-motor **44** and the cam **45** forced upwardly. Thus the spring **24** is expanded and, provided that a constant pressure exists at **17**, i. e. on the bellows **19**, the jet pipe **22** is deflected to the left. The valve **20** is closed still further, which results in an increase of pressure at **17** until the equilibrium is re-established between the reduced tension of the spring **24** and the force acting on the jet pipe **22** in the opposite direction, i. e. the force resulting from the difference between the bellows **19** and the weight **19*a***.

A pressure increase at **17** causes a displacement of the evaporation zone toward the output end of the passage **1**, as a higher pressure is coordinate with a corresponding higher saturated vapor temperature which only occurs at a point lying a distance between the points **17** and **36** in accordance with the pressure increase at this point. In this way the length of the superheater section is reduced. This reduction in length does not represent a drawback, on the contrary, at a load increase the rate of the flow of vapor through the superheater section increases correspondingly. This rate increase, however, results in an enhancement of the heating process with the consequence that the temperature of the issuing superheated vapor would increase if the length of the superheating section, i. e. the position of the evaporation zone in the passage, were to remain the same. The reduction in length of the superheater section results in a compensation in the sense of maintaining constant the temperature of the issuing superheated vapor.

A load decrease results in an increase in tension of the spring **24**, i. e. a pressure decrease at **17**, and hence in a displacement toward the input end of the passage of the evaporation zone, which of course likewise acts in the sense of maintaining constant the temperature of the super-heated vapor entering the main or consumption conduit **5**.

If in distinction from this embodiment shown in the drawing it is desirable that a load increase be accompanied by a displacement of the evaporation zone toward the input end, it will only be necessary to exchange the action of the conduits **46**, **47** leading from the jet pipe **43** to the servo-motor **44**.

For the purpose of a simple reversion of the control of the spring **24**, the two pressure fluid conduits **46**, **47** may be each provided with a cock **48**, **49**, respectively, and with additional conduits in the manner shown in Fig. 2. The two cocks are coupled with each other and may easily be reversed from one controlling direction to the other by a single turn.

In the position indicated in Fig. 2 the left receiving nozzle of the jet pipe **43** is connected to the lower point of connection of the servo-motor

44 and the right receiving nozzle to the upper point of connection. The arrangement according to the invention thus operates in the sense of the temperature of the issuing vapor being maintained constant.

If the two cocks are turned simultaneously by 90°, the result is the position shown in Fig. 3 in which the left receiving nozzle of the jet pipe 43 communicates with the upper end of the servo-motor 44 and the right nozzle with the lower end of same. At the same deflecting direction of the jet pipe 43 the controlling direction is thus reversed (which is tantamount to increased storing capacity of the vapor generator).

As will be readily understood, the novel and useful displacement of the evaporation zone can be obtained not only by adjusting the tension of the spring 24, i. e. the value of the pressure at 17, but also by adjusting the value of the temperature at 36 to be maintained constant. In like manner it may be arranged for the pressure value at 17 and the temperature value at 36 to be adjusted in response for instance to the load variation.

The means above described are based on the principle to displace the evaporation zone by varying the pressure to be maintained constant at 17, i. e. the tension of the spring 24. It is, however, likewise possible to displace the evaporation zone by varying the temperature value to be maintained constant, i. e. the temperature at the member 36. To this end the relay 37 must be influenced in the same manner as the relay 22 by varying the initial tension of the spring 24.

The relay 37 comprises a jet pipe 50 the receiving nozzles of which communicate with two conduits 51, 52 leading to the servo-motor 38 for controlling by means of the cam 39 the ratio slide 40. The temperature sensitive member 36 is shown to be a tube 53 connected to a loop 1*a* of the passage 1, so that the tube 53 assumes the temperature of the loop 1*a*, i. e. the temperature of the vapor. The tube 53 is of a material having a high coefficient of expansion by heat. Within the tube there is provided a rod 54 one end of which is fastened to one end of the tube 53 whilst its other end is connected to a lever 55 swingably supported on a knife edge 56 and co-operating with the jet pipe 50. In the opposite direction a spring 57 acts upon the jet pipe as is usual in the well known Askania jet pipe relay.

The knife edge 56 may be displaced in a direction transverse to the lever 55 by means of a link 58 swingably mounted at 59 and operatively connected to the rod 60 of a servo-motor piston 61. This servo-motor belongs to the jet pipe 43, two conduits 46*a*, 47*a* branching off the conduits 46, 47 as shown in Fig. 1.

The conduits 46 and 47 as well as the conduits 46*a* and 47*a* are each provided with a stop valve 62, 63 and 64, 65, respectively in such manner that by closing the valves 64, 65 the evaporation zone will be displaced by varying the initial tension of the spring 24 whilst by closing the valves 62, 63 the evaporation zone will be displaced by varying the temperature value to be maintained constant at 36 in the manner now to be described.

Be it assumed that the evaporation zone shifts in the direction toward the output end of the passage 1. Such a displacement results in a decrease of the temperature at 35 so that, due to a contraction of the tube 53, the rod 54 rocks clockwise thereby deflecting the jet pipe 50 likewise in a clockwise direction and displaces the piston of the servo-motor 38 to the left. In consequence thereof the fuel supply will be decreased until the evaporation zone returns to 17 as described above. The same operation may be obtained by varying the temperature value to be maintained constant in the following manner: As soon as the knife edge 56 is displaced to the right, for instance, the spring 57 deflects the jet pipe in clockwise manner, thereby reducing the fuel supply and thus reducing the temperature to be maintained constant at 36. As will be readily understood from the drawing, any displacement of the servo-motor piston 61 results in a displacement of the knife edge 56 corresponding to the variation in the tension of the spring 24 produced by a deflection of the jet pipe 43, which results from any load variation.

If it should be desirable to vary not only the pressure value to be maintained constant at 17 or the temperature value at 36, but both of said values, all the valves 62, 63, 64 and 65 would be opened. In such event I prefer to provide means for a successive operation of the servo-motors 44 and 61 in such a manner that upon a load variation the servo-motor 44 is first put into operation and influences the spring 24, i. e. the pressure to be maintained constant at 17 and subsequently the servo-motor 61, which influences the temperature to be maintained constant at 36. In view of this the springs 66 and 67 may be arranged at both sides of the servo-motor piston 61 to retain the piston in its middle position until the servo-motor 44 approaches the end of its stroke.

In another embodiment the springs 66 and 67 may be inserted in the servo-motor 44 so that the servo-motor 61 is put into operation before the servo-motor 44.

For the sake of completeness it may be submitted that it is further possible to use, instead of the springs 66 and 67 any other arrangement according to which the servo-motor which should operate first automatically controls the valves 62, 63 and 64, 65 of the other servo-motor. The respective valves remain closed until the piston of the servo-motor operating in the first place approaches the end of its stroke. The servo-motor is put in action by automatic opening of said valves.

It is to be noted that the desired displacement of the zone of evaporation need not be effected in dependence on the load but may just as well be achieved in response to other operating values as for instance the temperature of the issuing superheated vapor. Control in response to the temperature of superheated vapor would be desirable particularly where the zone of evaporation is to be displaced as a means of preventing fluctuations in the superheated vapor temperature.

FERDINAND RIEDEL.

PUBLISHED

MAY 25, 1943.

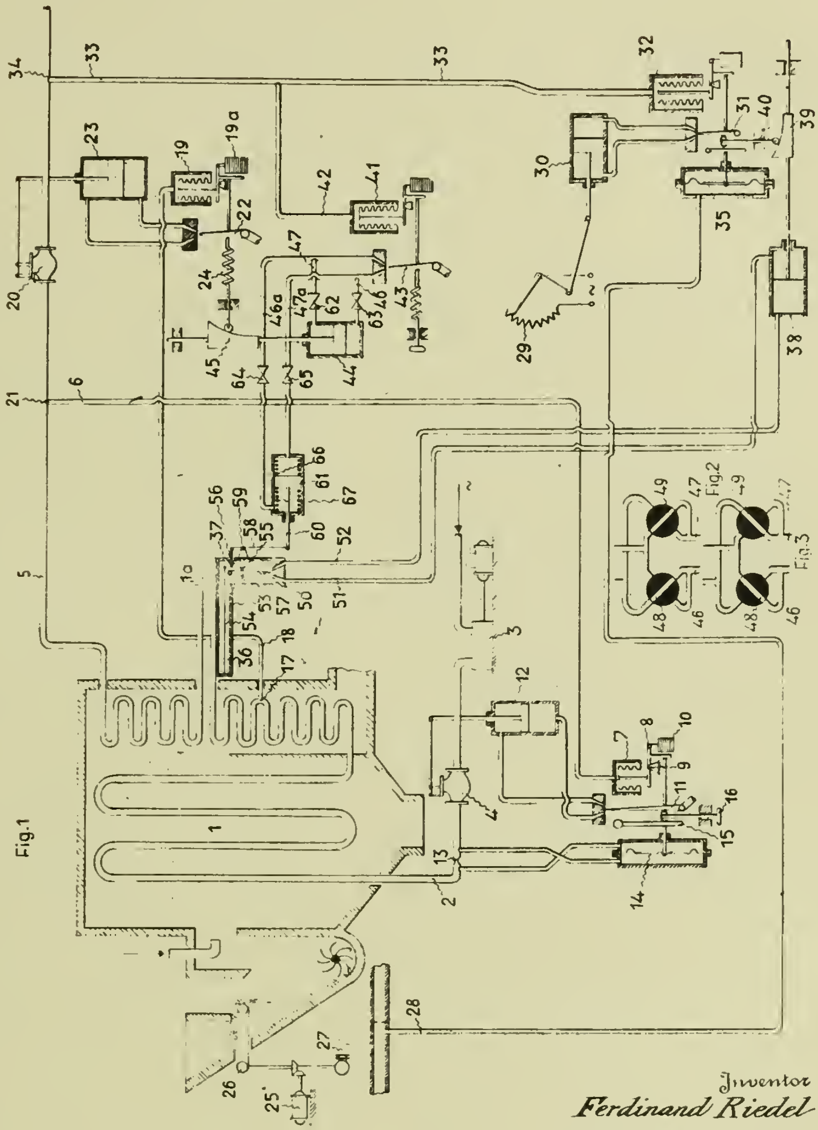
BY A. P. C.

F. RIEDEL

CONTROL DEVICE FOR ONCE-THROUGH VAPOR GENERATORS

Filed Aug. 27, 1940

Serial No. 354,449



Inventor

Ferdinand Riedel

By A. D. Adams

Attorney

Published May 25, 1943 Serial No. 355,383

ALIEN PROPERTY CUSTODIAN

SELECTING MECHANISM FOR CALCULATING MACHINES

Karl Berthold Wilhelm Kiel, Glashutte, Germany; vested in the Alien Property Custodian

Application filed September 4, 1940

This invention relates to a new and improved selecting mechanism for calculating machines.

It is an object of the invention to provide a simplified gear mechanism for the selecting operation in order to make the operation of the calculating machine quieter and avoid the knocking noises, especially during rapid calculation speeds, noticeable in certain types of machines, as, for example, the Odhner and Thomas types.

A further object of the invention is to provide the totalizer actuator shafts with gearing shiftable by the keys into mesh with coordinated gearing driven by the main calculating shaft and such coordinated gearing is calibrated so as to rotate during a machine cycle in direct proportion to the key value.

It is a further object to provide the above mentioned coordinated gearing upon shafts which extend transversely of the machine and provide one of such shafts for each transverse row of keys. In the usual type of machine having nine keys in each bank there will therefore be nine of these shafts and they will have a rotation ratio with respect to one another as 1:2:3:4:5:6:7:8:9 in correspondence with the keys respectively having the values from "1" to "9."

A further object of the invention is to provide a construction wherein the main gearing elements may be permanently encased in oil.

A still further object is to provide means which will positively prevent the operation of more than one key in each bank and which therefore protects the selecting gearing provided.

A further object is to provide a clearing mechanism operable upon depression of a key to clear the other keys in the same bank in order to protect the selecting gearing provided or operable to clear the entire keyboard.

With the above and other objects in view which will appear from the detailed description below, the invention, in a preferred modification which is not to be interpreted in a limiting sense, is shown in the drawings, in which:

Fig. 1 is a partial cross sectional view through a calculating machine illustrating particularly the selecting mechanism according to the invention.

Fig. 2 is a top plan view, partly diagrammatic for greater clarity and also with the keyboard, keys and associated parts removed illustrating particularly the selecting gearing of the selecting mechanism.

Fig. 3 is a sectional view taken on section line III—III of Fig. 2, with the casing removed, showing the cooperating gears for securing the proper rotation ratios for the selecting gearing.

Fig. 4 is a partial sectional view taken on section line IV—IV of Fig. 1.

Fig. 5 is a partial sectional view taken on section line V—V of Fig. 1, and

Fig. 6 is a view of a portion of Fig. 1 showing the position taken by certain elements upon depression of the "8" key.

The frame of the machine consists of the two side walls **1** and **3** and the front wall **2**. In the two side walls are located the shafts 4^1, 4^2, 4^3, . . . 4^9. These shafts are so driven that they revolve in the ratio of 1:2:3:4:5:6:7:8:9:. Thus while shaft 4^1 makes one revolution, shaft 4^2 makes two and shaft 4^9, for example, nine revolutions. These shafts are driven from the main shaft **5**, which makes a complete revolution for each computation.

The main shaft **5** is driven from the main gear shaft **116** which extends across the machine by means of bevel gears **114** and **115**. The main gear shaft **116** is driven by the driving motor in any desired manner. For example, the main gear shaft **116** can be connected with the drive of the machine as described in the application Ser. No. 117,952, filed December 28, 1936.

The main shaft **5** is connected with shaft 4^9 by means of a pair of bevel gears **6** and **7**, which in view of the fact that the bevel gears **6** and **7** possess the same number of teeth (in the present form **15** teeth each) turn with the same number of revolutions as shaft **5**. At the other end of shaft 4^9 a spur gear **8** is fixed, which meshes with an intermediate gear **9** which in turn meshes with spur gear **10**. The intermediate gear **9** is mounted on a shaft **11** which is fastened on the side wall **1** of the frame. Inasmuch as the spur gear **8** in the present form has sixteen teeth and the spur gear **10** eighteen teeth, the relation of revolutions between the two shafts 4^9 and 4^8 is 9:8, so that while shaft 4^9 executes a full revolution, shaft 4^8 makes only 8/9 of a revolution.

Beside the spur gear **10** another spur gear **12** is located on shaft 4^8, which by means of an intermediate gear **13** rotates a spur gear **14**. The spur gear **14** is fastened on shaft 4^7, while the spur gear **13** is freely mounted on an axle **15** which is secured to the side wall **1** of the frame.

The teeth of the spur gears **12** and **14** are in the proportion of 7:8, with the result that while shaft 4^9 executes a complete revolution, shaft 4^7 executes 7/9 of a revolution. On shaft 4^7 is located, moreover, a spur gear **16**, which meshes with an intermediate gear **17** which in turn meshes with a spur gear **18** which is secured to shaft 4^6. The intermediate gear **17** is freely

mounted on axle 19 which is fastened on the side wall 1 of the frame. Inasmuch as the number of teeth of the spur gears 16 and 18 is in the proportion of 12:14, shaft 4^6 executes $\frac{6}{7}$ of a revolution while shaft 4^9 executes a complete revolution.

It is easily understood that the propulsion of shaft 4^5 could be effected by a proper series of gears between the shafts 4^6 and 4^5. However, in order to avoid an injurious play of teeth, shaft 4^5 is driven directly from the main shaft 5, that is, by means of the bevel gears 20 and 21. The ratio of the teeth on the two bevel gears 20 and 21 is 5:9 (the bevel gear 20 has in the present form fifteen teeth and gear 21 twenty seven teeth). Therefore, while shaft 5 or 4^9, respectively, executes a complete revolution, shaft 4^5 executes only $\frac{5}{9}$ of a revolution.

At the free end of shaft 4^5 there is fixed a spur gear 22 which meshes with a spur gear 23. The spur gear 23 is freely mounted on axle 24, which is fastened on the side wall 1 of the frame, and it, in turn, meshes with a spur gear 25. The spur gear 25 meshes with another spur gear 26 which is fastened on shaft 4^4. The ratio between the gears 22, 23, 25 and 26 is such that the revolution of shafts 4^5 and 4^4 is in the proportion of 5:4. In the present form this is effected by giving spur gear 22, twelve teeth, spur gear 23, fifteen teeth and to spur gears 25 and 26 twelve teeth each. Thus shaft 4^4 will execute $\frac{4}{9}$ of a revolution during a complete revolution of shaft 4^9.

Spur gear 26 on shaft 4^4 meshes with another spur gear 27 which is freely mounted on axle 28 which is fastened on the side wall 1 of the frame. With spur gear 27 there is connected another spur gear 29 which meshes with spur gear 30 which is on shaft 4^3. The ratio between the spur gears 26, 27, 29 and 30 is so determined, that the ratio of revolutions of shafts 4^4 and 4^3 is 4:3. For this purpose spur gear 27 has sixteen teeth and the spur gears 29 and 30, twelve teeth each in the present form. During a complete revolution of shaft 4^9 shaft 4^3 will execute $\frac{3}{9}$ of a revolution.

Spur gear 30 meshes with a spur gear 31 which is freely mounted on axle 32, which is fastened on the side wall 1 of the frame. With spur gear 31 is connected another spur gear 33, which meshes with a spur gear 34, which is fastened on shaft 4^2. The number of teeth of the spur gears 30, 31, 33 and 34 is so determined that the ratio between the revolutions of shafts 4^3 and 4^2 is 3:2. For this purpose, spur gear 31 has eighteen teeth and the spur gears 33 and 34, twelve teeth each in the present modification. While shaft 4^9 executes a complete revolution, shaft 4^2 executes only $\frac{2}{9}$ of a revolution.

Finally, the spur gear 34 meshes with a spur gear 35 which is located on axle 36 which is fastened on the side wall 1 of the frame. With spur gear 35 is connected a spur gear 37 which meshes with a spur gear 38, which is mounted on shaft 4^1. Inasmuch as spur gear 35 in the present form has sixteen teeth, spur gear 37 twelve teeth and spur gear 38 eighteen teeth, the ratio between the revolutions of shafts 4^2 and 4^1 is 2:1. During a complete revolution of shaft 4^9, shaft 4^1 executes only $\frac{1}{9}$ of a revolution.

On each of shafts 4^1, 4^2, 4^3, . . . 4^9 there are fastened at equal spaces from one another bevel gears 39 corresponding in number to the banks of keys. In the present modification 10 banks of keys have been provided for and in accordance therewith there are arranged on each shaft 4^1, 4^2, 4^3, . . . 4^9, ten bevel gears 39. These bevel gears 39 which in the present modification have nine teeth each mesh each with a bevel gear 40. The bevel gears 40 are fastened on shafts 41 which are mounted in the frame plate 42. As may be seen from Fig. 1 the bevel gears 40 are coordinated with the bevel gears 43, which are fastened on the upper ends of the shafts 41.

The bevel gears 43 are coordinated with the bevel gears 44 which are arranged non-rotatably but slidably on the square cross sectional totalizer actuator shafts 45 of the calculating mechanism. Inasmuch as in the present modification a calculating machine with a 10-bank selecting mechanism is provided, there are consequently, ten of these actuator shafts 45 of the calculating mechanism. In Fig. 2 only one of them has been shown while the other nine are indicated diagrammatically by the dot and dash lines. On each actuator shaft 45 of the calculating mechanism there are arranged nine bevel gears 44 coordinated with the nine bevel gears 43. The actuator shafts of the calculating mechanism are journalled partly in the front wall 2 of the frame and partly in the frame plate 46. In order to prevent bending of the actuator shafts 45 of the calculating mechanism, they are furnished with casings 47 journalled in the frame plate 48.

Each bevel gear 44 is furnished with a collar 49 having an annular groove 50 in which the pins 53 on the forked ends 51 of an elbow lever 52 engage. The levers 52 are pivoted at 54 on the frame 55. Corresponding to the ten actuator shafts there are provided ten banks of keys. Each bank has a U-shaped frame 55, which is fastened on a strip-like cover plate 56. In each bank of keys, there are nine key stems 57 arranged to slide axially, each being furnished with a radially projecting pin 58. A compression spring 59 bears at one end against this pin while the other end rests on the lower horizontal portion of the frame 55. These springs 59 tend to hold the key stems 57 in their initial upper position and the upper ends of the stems are furnished with the key knobs 60. The pins 58 engage the forked ends 61 of the elbow levers 52, so that when a key is pressed down the bevel gear 44 coordinated therewith meshes with the gear 43 designed to cooperate therewith.

In order to maintain the key in depressed position, each bank of keys is provided with a locking bar 62, which is slidably mounted on the frame 55 of each bank of keys by means of the fastening screws 63 extending through appropriate slots 64 in the bar 62. A spring 66 is secured to each bar 62 at 65 at the right hand end as seen in Fig. 1 while the other end of the spring is fastened to the frame of the bank of keys at 67.

Bar 62 is provided with slots 68 having the shape shown on Figs. 1 and 6. A pin 69 provided on each key stem 57 extends into the slot 68 coordinated therewith. Now when a key is pressed, the corresponding bar 62 is moved against the traction of its spring 66 because of the peculiar cut of the slot 68 and any key in the same bank of keys which may be locked in depressed position is released. This prevents gear damage. As soon as the pin 69 of the actuated key has cleared the slot 68, the bar 62 returns to its initial position under the force of its spring 66 and is positioned over the pin 69 of the pressed key and locks such key so that it is maintained in depressed position. As a result and by virtue of this, the coordinated bevel gear 44 is also held in mesh with the coordinated gear 43. In Fig. 6 the "8" key is shown in depressed position.

The same figure shows the corresponding bevel gear 44 on the corresponding actuator shaft 45

of the calculating mechanism in mesh with the bevel gear **43** which is moved by shaft **4**[8].

The clearance of the keyboard can be effected by rotation of the shaft **70** which carries a bar **71**. The bar **71** extends across all the bars **62**, so that by a turning of shaft **70**, in the direction of the arrow shown in Fig. 1, all the bars **62** are moved and brought to clearance position.

The device for showing the value set up in the keyboard may be made in a great many ways. In the present modification a pin **72** is fastened on each key stem **57** for this purpose and each pin projects into the field of movement of an inclined bar **73** for each bank of keys. Each bar **73** is pivotally connected to two levers **74** and **75** which in turn are pivotally connected at **76** and **77**, respectively, to the frame **55**. A draw spring **78** acting on the lever **75** tends to hold the bar **73** in the initial position shown in Fig. 1. Lever **74** carries by means of an extension **79** a toothed segment **80**, which meshes with the small gear **81** of a numeral drum **82** mounted on shaft **83**. The value of a key depressed may be read in the sight window **84** since, as is obvious, the inclined position of the bar **73** will cause the segment **80** and consequently the numeral drum **82** to move proportionately to the key value.

In order to avoid disturbances and damage in the operation of the machine on pressing down two keys of the same bank of keys, the following arrangement is provided.

Between each two adjacent key stems **57**, a swivelling plate **86** pivoted at **85** is placed with the lower end thereof shaped as shown in Figs. 1 and 6. The plates **86** assume normally the position shown in Fig. 1, with a space between the end plates and the abutments **87** and **88** provided on both sides. The space at each end added together corresponds substantially to the diameter of a bolt **89** provided on each key stem **57**. Now, if any key is pressed, the bolt **89** thereon, as can be seen from Fig. 6, will enter between the plates which lie in its field and cause the plates **86** on each side to form a closed row without gaps thereby preventing actuation of another key in the same bank. On the other hand, if two keys should be pressed at the same time by mistake, the free space between the plates **86** would not permit two bolts **89** to enter at the same time between the plates. Thus the operator would be forced to release the key pressed down with the other by mistake, so that the desired setting can take place.

It must be mentioned, also, that in the present modification the bevel gears **40** and **43**, as well as the bevel gears **39** have each nine teeth while the shiftable gears **44** have ten teeth.

On each actuator shaft **45** of the calculating mechanism, a gear mounting **90** is slidably but non-rotatively mounted and it carries at its ends the bevel gears **91** and **92**. These bevel gears **91** and **92** have like the cooperating bevel gear **93** ten teeth each. The bevel gears **93** are fixed on shafts **94** which are vertically positioned. These shafts **94** and gears **93** are located in the carriage of the calculating mechanism. Only the subframe **95** of the carriage is shown. Each of the shafts **94** is provided at its upper end with a bevel gear **96** which meshes with a bevel gear **97** having the same number of teeth. The gear **97** turns freely on a shaft **98** mounted in and extending through the carriage of the calculating mechanism. The gear **97** is connected with a spur gear **99** which meshes with spur gear **100**. The spur gear **100** is freely rotatable on a shaft **101** which is mounted in the carriage of the calculating mechanism. The spur gear **100** acts by means of a planet gear mechanism, not shown, on the coordinated numeral drum **102**. The movement of the planet gear takes care of the tens transfer and this mechanism can be arranged as described, for example, in British Patent 450,599.

The gear mountings **90** are controlled by the shift bar **110** which is actuated in well known manner. This bar **110** for the shifting of the carriage has moved the mountings **90** into the neutral position shown in Fig. 1. During the various calculations, whether addition, subtraction, multiplication, or division, as the case may be, the bar **110** will bring the gears **91** or the gears **92** into mesh with the gears **93**.

The operation is believed to be clear without further explanation. If, for example, as shown in Fig. 6, the "8" key is pressed in a bank of keys, the coordinated gear **44** is meshed with its cooperating gear **43**. Such gear **43** is driven from the shaft **4**[8] through the coordinated gears **40** and **39**. In accordance with the explanation set forth above, the shaft **4**[8] would execute $\frac{8}{9}$ of a revolution in each cycle of the machine, i. e., with each complete rotation of the main shaft **5**. This means that the corresponding gear **43** rotates in each cycle the gear **44** eight teeth, so that actuator shaft **45** makes $\frac{8}{10}$ of a revolution. Let us assume that the multiplier is "4", then the shaft **45** is rotated 3.2 times while the main shaft executes four cycles. This means that the numeral drum **102** is turned 3.2 times through the medium of gears **91**, **93**, **96**, **97**, **99** and **100**, so that in the sight window **103** a "2" will show while the numeral drum **102** of the next higher decimal position will show a "3" in its sight window which is taken care of by the tens transfer mechanism.

In order to insure that the shafts **45** do not turn because of vibrations and the like, a stop disk **104** is provided on each shaft **45**, which, as shown in Fig. 5, is provided on its periphery with ten indentures with which a leaf spring **105** cooperates. The leaf springs **105** are secured by means of screws **106** to a bar **107** mounted on the frame.

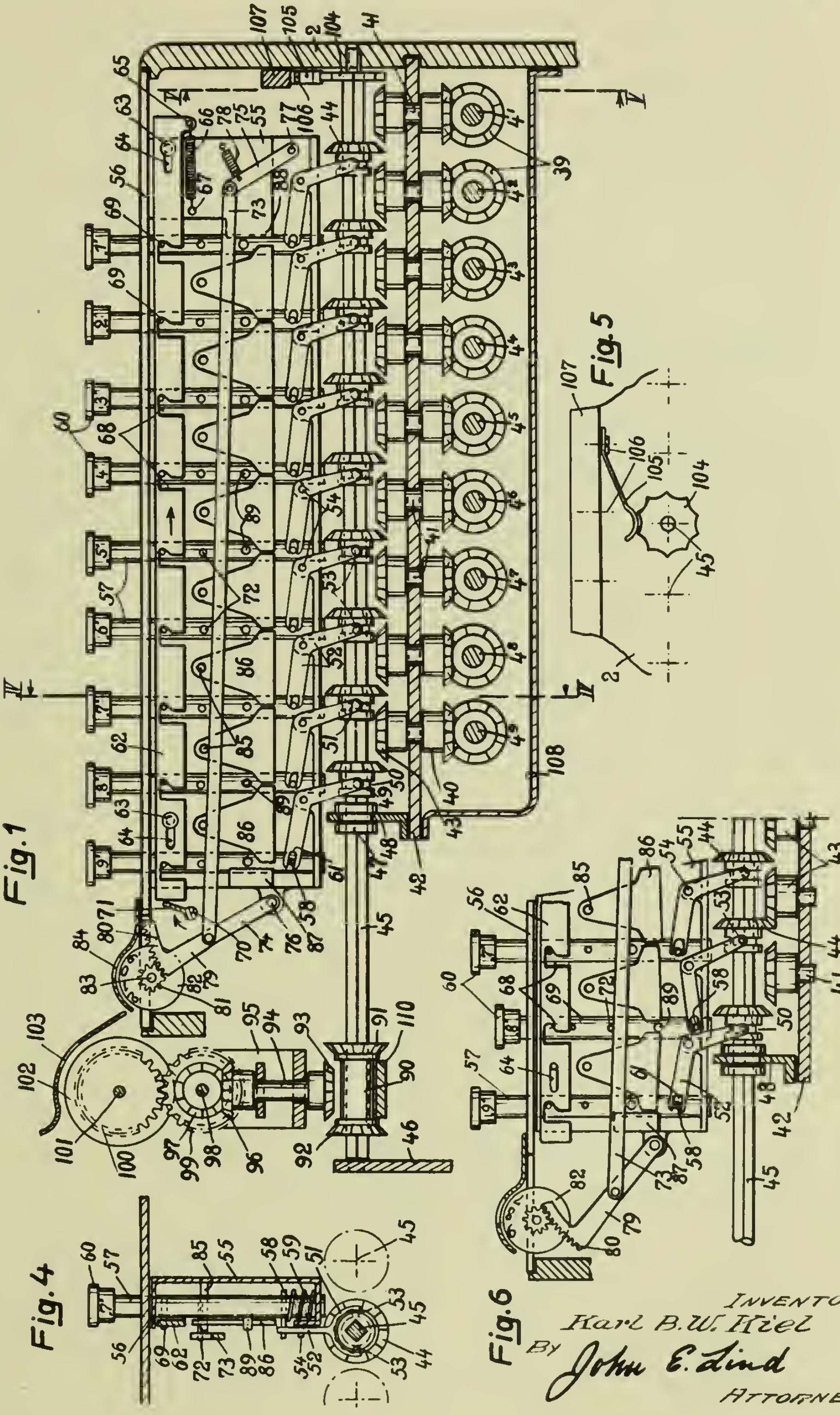
The gears which are in constant mesh are encased in oil for permanent lubrication and the oil-tight casings **108** and **109** are provided for this purpose. Due to the peculiar construction provided, the main gearing elements may be located within the oil-tight casings provided.

KARL BERTHOLD WILHELM KIEL.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

K. B. W. KIEL
SELECTING MECHANISM FOR CALCULATING MACHINES
Filed Sept. 4, 1940

Serial No.
355,383
2 Sheets-Sheet 1



INVENTOR
Karl B.W. Kiel
By John E. Lind
ATTORNEY

PUBLISHED

MAY 25, 1943.

BY A. P. C.

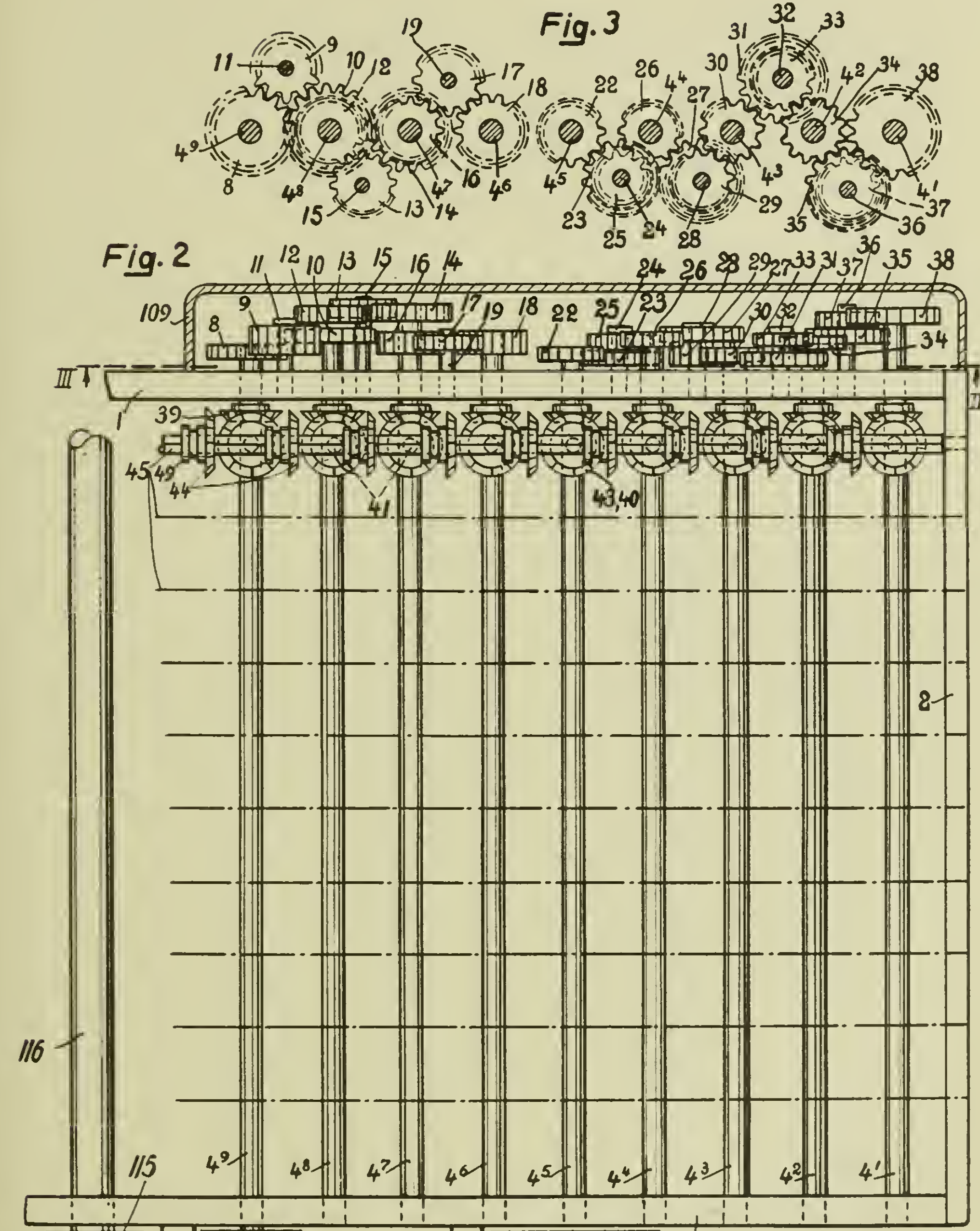
K. B. W. KIEL

SELECTING MECHANISM FOR CALCULATING MACHINES

Filed Sept. 4, 1940

Serial No. 355,383

2 Sheets-Sheet 2



INVENTOR
Karl B. W. Kiel
BY John E. Lind
ATTORNEY

Published May 25, 1943

Serial No. 356,260

ALIEN PROPERTY CUSTODIAN

ELECTROSTATIC LENSES FOR CORPUSCULAR RAY APPARATUS

Bodo von Borries and Ernst Ruska, Berlin-Spandau, Germany; vested in the Alien Property Custodian

Application filed September 11, 1940

This invention relates to electrostatic lenses for corpuscular ray apparatus, particularly for electronic microscopes.

It is known in the art to employ in corpuscular ray apparatus, for instance, in electronic microscopes electrostatic or magnetic lenses for influencing the rays emitting from the ray producing source. The invention relates to electrostatic lenses for the above purpose. These lenses consist, as a rule, of two electrodes between which a potential difference is maintained to produce the desired effect. To obtain a symmetrical form of the electric fields, which is the first prerequisite of a faultless lens, it is necessary to center the two lens electrodes very accurately with respect to each other. According to the invention the two electrodes of such an electrostatic lens provided with conical contact surfaces are arranged in an insulator. In this manner a properly centered mechanically fixed electrostatic lens is obtained. The arrangement may be so designed that the lenses withstand a high voltage and that electrodes of any shape may be alternately replaced. By the use of conical contact surfaces for securing both electrodes to the insulator the electrodes may be brought again into alignment at all times when replacing the same. The arrangement is, for instance, so designed that the one electrode is integral with the outer wall of the apparatus and is impressed with earth potential and that high voltage is supplied to the other electrode by a particular bushing. Also this bushing is then so designed that an insulator which is secured to the bushings through conical contact surfaces as well as to the outer wall is arranged between the current carrying parts of the bushing and the grounded outer wall of the apparatus.

The conical contact surfaces of the lens insulator are arranged according to the invention preferably concentrically to the center line of the ray. A very simple lens construction is obtained by providing the outer grounded tubular part of the apparatus carrying the lens with an inner cone in which fits a corresponding outer cone of the insulator. In this case this insulator is provided with a conical bore in which fits a corresponding outer cone of the lens electrode impressed with a high voltage. The electrodes themselves may, for instance, consist of a tubular part provided with a central opening and lying symmetrically to the center line of the ray as well as of a part also provided with a central opening and lying perpendicularly to the center line of the ray. If such lenses which are operated at very high voltages are employed, the insulators are preferably given according to the invention such a form that the insulators project into the space free of electrostatic fields formed between the outer wall of the apparatus and the electrode impressed with the same potential. In this manner such a form of the electric acceleration field is attained that no electric lines of force pass from one electrode to the other which run tangentially to the surface of the insulator without passing through the latter. Discharges which otherwise occur at high voltages are thus avoided.

The invention may particularly be employed for the objective lens and projection lens of an electronic microscope. In this case the arrangement may be simplified considerably by employing for the two lenses one and the same high-voltage bushing. The parts of both lenses impressed with a high voltage may then be so designed as to face each other. In order to assemble the electronic microscope in a simple manner and to replace the individual lens parts as quickly as possible the individual electrodes and the insulator are preferably so dimensioned that the entire lens system may be placed in the vacuum tube from one side, for instance, from the side of the ray producing source. In this case, this vacuum tube itself is made of two pieces which are assembled, for instance, at the point where the objective lens is arranged, the conical surfaces of the two parts being in engagement with each other.

Further details of the invention will be apparent from the following description taken in connection with the accompanying drawings.

Fig. 1 shows a cross-sectional view of a part of an electronic microscope provided with two electric lenses serving to magnify the object. 1 denotes the middle portion of the outer vacuum wall of the electronic microscope. The cathode (not shown) and the object sluice (not shown) are firmly secured to the part 2. The stream of electrons coming from above strikes the object cartridge 4 which serves as a carrier for the object to be magnified. The objective lens consists of the two electrodes 5 and 6. The electrode 5 is impressed with earth potential and is integral with the vacuum wall 2. The electrode 6 has a tubular part 7 lying concentrically with respect to the center line of the ray as well as a part 8 lying perpendicularly to the center line of the ray. To support the electrode 6 against the vacuum wall 1 an insulator 9 is employed. 10 and 11 denote the conical surfaces of the vacuum

wall 1 and the insulator 9, of the insulator 9 and electrode 7 respectively.

The projection lens consists of the electrode 12 impressed with a high voltage and of the electrode 13 connected to earth. The electrode 13 is integral with the vacuum wall 1. The electrode 12 is also provided with a tubular part 14 lying concentrically to the center line of the ray and with a part 15 lying perpendicularly to the center line of the ray. This part is designed on the inner side in the form of a luminous screen 16 on which appears the intermediate image. To support the electrode 12 against the vacuum wall 1 an insulator 17 is employed having corresponding conical contact surfaces 18 and 19. The insulators 9 and 17 are provided at their outer periphery with recesses 42 and 43 respectively opposite to which are arranged openings 44 and 45 respectively provided in the parts 5 and 13. In this manner a flow of the air to be exhausted is made possible.

The high voltage is supplied to the electrodes 6 and 12 by a bushing. In the embodiment shown it is assumed that the electrodes 6 and 12 are impressed with different voltages. The current is supplied to the electrode 6 and electrode 12 by the conductors 20 and 21 respectively. In this embodiment it is possible to control both lenses independently of one another. In this case, the voltage which the electrodes 6 and 12 must have with respect to each other is small as compared to the voltages which the electrodes 6 and 12 have with respect to the tube 1. 22 denotes an insulating piece whose conical contact surfaces 23 and 24 are in engagement with the outer wall 1 and the insert 25 of the bushing.

An inspection window 26 arranged in the vacuum wall 1 as well as a prism 27 arranged inside the electrode 12 serve to observe the intermediate image. In order that the image of the field is not impaired a wire net 29 is arranged in front of the opening 28 provided in the part 14 of the electrode 12.

The assembly of the arrangement is effected in the following manner: The insulator 17 is first placed in the vacuum wall 1, and the electrode 12, the parts 22 and 25, the insulator 9 and the electrode 6 are then positioned in the microscope. The upper part 2 of the electronic microscope is hereafter placed on the upper end of the vacuum tube 1. In order to enable the assembly of the above parts, the outer and inner dimensions of the insulators 17 and 9 and of the electrodes 12 and 6 are correspondingly dimensioned.

While the arrangement shown in Fig. 1 lends itself above all to such microscopes whose lens voltages are not too high, it is advisable to employ for very high voltages other forms of insulators. An embodiment for electronic microscopes of this character is shown in Fig. 2, in which the same characters denote corresponding parts of Fig. 1. In Fig. 2, 33 denotes an insulator which serves to insulate the high-voltage bushing 30 against the grounded outer jacket 1 of the apparatus. The conical contact surfaces 31 and 32 serve to support the insulator and the bushing 30. In this embodiment it is assumed that the two electrodes 6 and 12 of both lenses are impressed with the same voltage. To attain a uniform distribution of the electric field a body 34 impressed with earth potential is arranged within the apparatus. The insulators 9 and 17 are provided with corresponding annular extensions 35, 36, 37, 38 which are given such a shape that the insulator extends in the space free of electrostatic fields formed between the grounded outer wall of the apparatus and the electrode impressed with the same voltage. In this manner discharges are prevented from occurring. Also the insulator 33 for the high-voltage bushing is provided with a corresponding annular extension 39. In the body 34 is arranged an inspection opening 28 provided with a wire net 41. Also in this embodiment the dimensions of the insulating parts (insulators, electrons and other inserts) are so chosen that the parts may be mounted in the apparatus one after the other before placing the upper part 2 of the microscope on the vacuum tube 1.

The electrodes 5 and 13 impressed with earth potential are slidably arranged in the embodiment shown in Fig. 2. Consequently, they may be subsequently centered in an accurate manner. The devices (not shown) for adjusting these electrodes may be so designed that the adjustment can also be effected during the operation. This is advisable particularly in the case of the electrode 5 facing the object to be magnified.

BODO VON BORRIES.
ERNST RUSKA.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

B. VON BORRIES ET AL
ELECTROSTATIC LENSES FOR CORPUSCULAR
RAY APPARATUS
Filed Sept. 11, 1940

Serial No.
356,260

Fig. 1

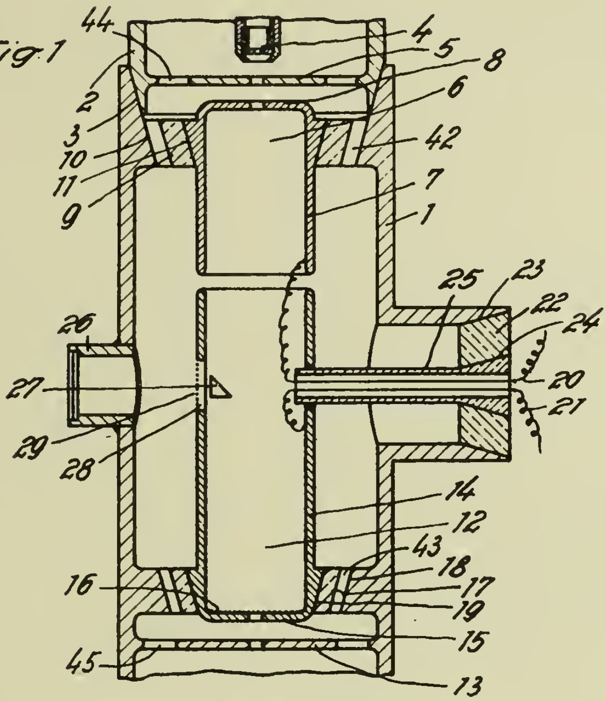
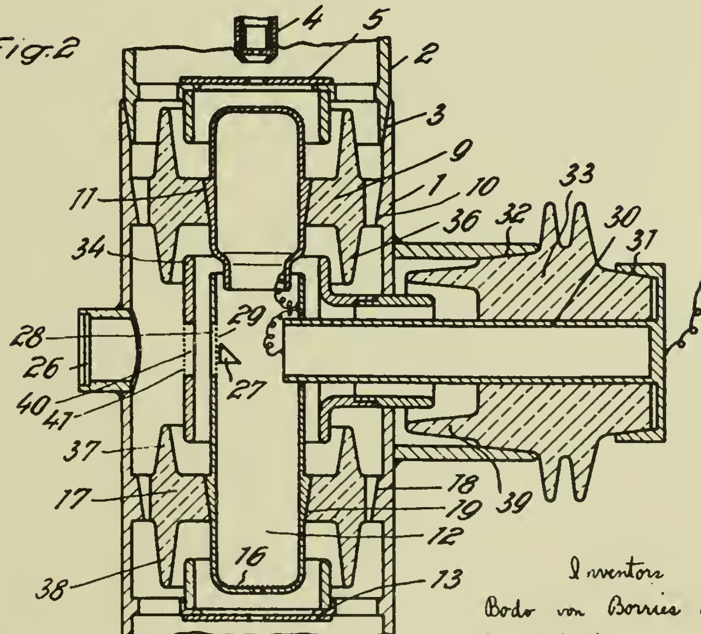


Fig. 2



Inventors
Bodo von Borries and
Ernst Ruska
by Knight Bros.
Attorneys

Published May 25, 1943 Serial No. 356,770

ALIEN PROPERTY CUSTODIAN

PACKING FOR FLUIDS

Louis de Kadt, Amsterdam, Holland; vested in the Alien Property Custodian

Application filed September 14, 1940

This invention relates to an inexpensive packing, more particularly for fluids or liquors for daily use such as cream, milk, oil and the like.

It is an object of the invention to provide for such a packing, more particularly a tube, which allows to again perform the air-tight seal desired, after part of the content has been poured out, so that the goods can be stored for later use.

Other objects of the invention will appear as the specification proceeds.

According to the invention the packing is given the form of a tube formed of a soft, pliant, foldable metal, which preferably has a plain bottom and which is sealed in the desired manner by bending-over the free flattened end of the tube. This end is provided with means for the applying of the openings in the wall of the tube which are necessary for the pouring out of the content and which are preferably arranged on opposite sides. Such a tube can be produced at little costs, since no particular sealing means are needed.

In the drawing affixed to this specification and forming part thereof some embodiments of the invention are illustrated diagrammatically by way of example.

In the drawing

Fig. 1 is a side elevation and

Fig. 2 is a front elevation of a tube according to the invention ready for use, while

Fig. 3 is a perspective view of part of the same tube after again being closed and sealed.

Figs. 4 and 5 show another modification of the invention.

Fig. 6 shows a third modification,

Figs. 7 and 8 show a fourth modification and

Fig. 9 a fifth modification of the invention.

Referring to the drawings and first to Figs. 1–3, the tube consists of a cylinder 1 made of soft metal and provided with a plain bottom 2 which allows to set down the tube in vertical position. In order to obtain the closure the free end which is arranged opposite to said bottom is once or several times folded or bent over and flattened, after liquor has been filled in and after the edges of this end, if desired, have been melted together and soldered whereby the closure or seal can be made air-tight to still a better degree.

Before folding a strip 3 is led against the flattened end. The projecting ends of the strip are formed each to a hook 4, the free end of which forms a sharp point 5. The ends of the strip can be formed in such a manner that one or several scrolls 6 are formed in one or both hooks, whereby these hooks get an increased elasticity. If thereupon the flattened end of the tube is folded over, the strip 3 is squeezed between the folds formed and is brought in a state in which the sharp points 5 are directed just under the folds obtained towards the wall of the cylinder 1 so that the points 5 penetrate into the soft material of this cylinder by a lateral pressure exerted on the two hooks 4, for instance by two fingers of a hand. In this manner two opposite openings 7 are pricked in the cylinder which due to the elasticity of the hooks 4 are set free after the hooks are released from pressure. One of these openings may then serve as dispensing hole, while air may enter the cylinder through the other opening so that the fluid can flow out more easily. The objection that the end of the hook 4 is arranged directly in front of the dispensing hole can easily be overcome by turning the strip 3 with the hooks 4 by a small angle, after the openings 7 have been made, whereby the folding is either a bit reduced or a bit furthered.

After the first dispensation the strip 3 and the hooks 4 can be used in the same manner. By some turns, for which the scrolls 6 mentioned above may serve as handy heavers, a fresh closure can be performed, since the openings 7 already obtained are enclosed in the new folds thus formed and are thereby sealed. In this manner the state illustrated in Fig. 3 is obtained, in which the hooks 4 can be used afresh for the applying of two opposite openings in the wall of the cylinder for a following dispensation.

This treatment can optionally be repeated in dependency on the quantity of the content and the use already made.

The strip 3, when received between the folds of the flattened end, may cause a less sufficient seal to be obtained by the folds. This drawback can be overcome by another arrangement of the means for the applying of the dispensing holes.

To this end the strip 3 in the modification shown in Figs. 4 and 5 is provided with a slit 8 which allows the strip to slide over the flattened end of the cylinder 1, so that the folds formed on the following bending are laid between and around the narrower strips formed, as can be seen from the drawing. If the seal even in this manner is not sufficiently tight in view of the liquor filled in the cylinder 1, one can use, as shown in Fig. 6, a somewhat elongated flattened end along which the strip which is provided with the slit 8 can be pushed so far that the folding can thereupon be performed entirely independently on the strip 3 and this strip does thus not any more hinder the folds formed to be strongly pressed so that they secure an excellent seal. As

can be seen from Fig. 6, the hooks 4 are in a horizontal position in which the points 5 are not directed towards the wall of the cylinder. On the one hand this is no disadvantage, since by means of the scrolls 6 a quarter of a turn can easily be obtained before the first dispensation whereby the points 5 arrive at the right place, while on the other hand the advantage is attained that for instance on transport of the tubes there is no danger that an unintended pressure on the hooks causes openings to be formed prematurely in the wall of the cylinder.

Figs. 7 and 8 show another modification according to which strip 3 is provided with a broadened foldable part 9 so that the strip 3, after the flattened end of the cylinder 1 has been entirely folded and pressed, can be pressed as a separate cap around the folds already obtained. The seal can still be improved in this manner so that the packing can be used even for fluids which exert some pressure, for instance effervescent liquors. Part 9 of the strip may further be provided with lips 10, as shown in dotted lines, which are bent over after the cap has been applied in order to make a good connection between the cap and the head of the cylinder.

In the modification shown in Fig. 9 the cap obtained by means of a bent-over strip 11 forms a separate part which embraces besides the flattened and folded end of the cylinder 1 the strip 3 which in this modification can be built up as shown for instance in Fig. 2.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

LOUIS DE KADT.

PUBLISHED

MAY 25, 1943.

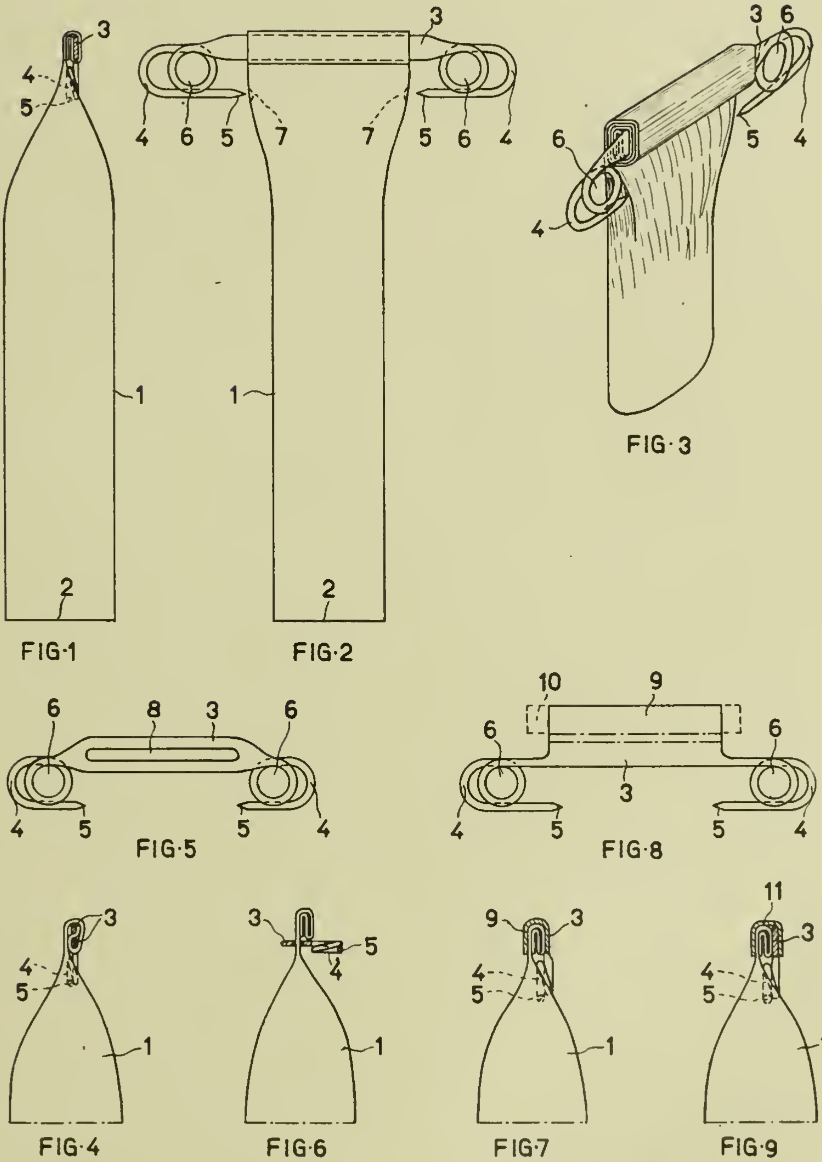
BY A. P. C.

L. DE KADT

PACKING FOR FLUIDS

Filed Sept. 14, 1940

Serial No.
356,770



Inventor
Louis de Kadt
By Michaelis & Michaelis, Attys

Published May 25, 1943 Serial No. 357,045

ALIEN PROPERTY CUSTODIAN

CONTROL DEVICE FOR VARYING THE SPEED OF PARACHUTES DURING THE DESCENT

Giuseppe Lisi, Rome, Italy; vested in the Alien Property Custodian

Application filed September 16, 1940

The present invention relates to a device for varying the speed of parachutes during the descent.

According to the present invention a parachute, besides having the normal surface and usual rope system, which starting from the periphery of the chute surface (preferably in correspondence to the cords or meridian seams) is united down below to a suspension member (generally a ring) to which the load is appended, is provided with a second system of ropes starting from a circular line lying in a plane parallel to the one of the periphery of the chute surface and lying furthermore on the calotte of the parachute, said ropes being down below connected to a second traction and suspension member, which by means of a convenient device may be at will approached to or removed from the first suspension member already mentioned, so that the surface of the parachute may be reduced or increased, the speed of descent varying consequently at will.

The device approaching to or removing from one another the two suspension members mentioned of the two rope systems comprises preferably a rope, which starting from the suspension member of the outside rope system (connected with the peripheric parallel of the parachute) passes through a pulley or in a ring of the suspension member of the inside rope system (connected with the minor parallel limiting the superior calotte of the parachute) and returns downwards in such a position as to be reached by the hand of the parachutist. Preferably this control cord is provided with knots or similar catching means in correspondence with the free part on which the parachutist's hands have to operate with the object to facilitate the manoeuvre.

The descent speed regulating device, constituting a true, proper change speed gear for parachutes and being the subject matter of the present invention, may be applied to all parachutes of a known type and already constructed by means of simple adaptations, particular by producing an advantage unforseen constituting another characteristic of the present invention. This unforeseen advantage lies in the fact that, when applying the control internal rope system, object of the present invention, to a normal parachute with a simple surface, already constructed, by exercising a light traction by means of the said control cord on the internal rope system, the result is obtained to reduce the normal descent speed of the parachute, while, when continuing the traction in a still greater proportion, the descent speed returns to the normal original value and consequently increases to a maximum value, when the parachute only functions with the upper calotte, while the portion of the surface comprised between the two suspension parallels of the internal and external rope system is completely bent upwards and the whole load is only applied to the internal rope system.

The change speed gear for parachutes, object of the present invention, may also be applied to special types of parachutes, for instance to the parachute with elastic rope system and shock absorbing skirt specified in the application 340,196 already filed in America, thus there being united the advantages of the elastic parachute for jumps from aircraft flying at a very high speed and the advantages of the parachute with variable descent speed, with which, for instance a parachutist may jump from a remarkable height, perform a first section of slow descent, effect a rapid descent as far as nearly the ground and slowing down again to reach the ground with a minimum speed.

The change speed gear according to the present invention finds thus an important application for military services, when for instance a great number of parachutists may jump from a great height in the same zone, after which the single parachutists by regulating the descent speed may be united together at a great height and then jump at a high speed towards the ground, braking during the last part of the descent, then grounding at the same time and substantially on the same point.

The invention is illustrated in the accompanying drawing in which:

The Fig. 1 shows a normal parachute provided with a change speed gear according to the present invention in the position of a slow descent;

Fig. 2 shows the same parachute in the position of a rapid descent.

Fig. 3 shows a parachute with an elastic rope system and shock absorbing skirt, according to the application already mentioned 340,196 provided with the change speed device object of the present invention.

Fig. 4 shows a detail of the control device for approaching the suspension member of the internal rope system to the suspension member of the external rope system.

With reference to Fig. 1 a normal parachute has the surface subdivided into two zones, that is a skirt **1** and an upper dome **2**, provided with a normal hole **3** in the vertex, by a line **4** parallel to the peripheric line **5**. The parallel **4** limits a

dome 2, whose size is such as to allow, when excluded the braking action of the skirt 1, a very high descent speed. On the line 4 there is fixed an internal rope system 6 connected into a suspension and traction member, comprising, for instance, the ring 7, the inextensible rope 8 and the ring or pulley 9. A control rope 10 secured to the suspension member 11 of the external rope system 12 passes through the ring or pulley 9 and returns downwards so as to be reached by the hand of the man suspended in 15 to the suspension member 11.

The external rope system 12 in the present case is provided with connecting points 13 for rope groups 12, each of said points 13 is united to the member 11 by means of inextensible cords 14.

The device functions as follows: in the descent at a low speed, the cord 10 is slackened, the weight 15 gravitates only on the suspension member 11 and the whole surface of the skirt 1 and calotte 2 constitutes the active surface of the parachute. When an increase of speed is wanted, a traction is exercised on the free part of the cord 10, thus the suspension member 9 approaching the suspension member 11, consequently by distribution in a variable proportion the load 15 between the external rope system 12 and the internal rope system 6, which when little by little the members 9 and 11 are approaching to one another, bears a part always greater than the load 15 till this load is completely supported when the whole is trimmed in the position shown in Fig. 2, this constituting the high speed trim. Should a reduction of speed be wanted, it is sufficient to diminish the traction exercised with the hands on the cord 10 heaving more or less the skirt 1 to come into action.

As already remarked, when beginning the application of the traction on the rope 10, the calotte formed by the skirt 1 and the upper dome 2 being thus lightly deformed, the speed instead of increasing, decreases at the beginning and descends below the value assumed when the whole load 15 is supported by the external rope system 12.

In Fig. 3, where the parts corresponding to those of Figures 1 and 2 are indicated with the same reference numbers, the inextensible cords 14 are replaced by rubber cords 16 making the suspension resilient and automatically regulated the speed; when the cord 10 is completely slackened and the suspension members 9 and 11 are connected by the inextensible rope 17 illustrated in Fig. 3. This type of parachute combines the advantages described in the application No. 340,196 already filed, and those according to the present invention.

In Fig. 4 there is illustrated a particular form of realisation of the suspension member 9 of the internal rope system. The member 9 is substantially of an ovoidal form and through its external groove there passes the rope 8 bent on itself and fixed by a binding 19. Inside the ovoid 9 there is mounted a pulley 18 around which there passes the control cord 10. By conveniently choosing the dimensions and plays between the cord 10, pulley 18 and ovoid 9, a perfect functioning of the device is secured.

The present invention has been illustrated and described in a preferred form of realisation, but it is understood that constructive changes may be practically introduced therein without surpassing the limits of protection of the present industrial patent.

GIUSEPPE LISI.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

G. LISI

CONTROL DEVICE FOR VARYING THE SPEED OF PARACHUTES DURING THE DESCENT

Filed Sept. 16, 1940

Serial No.

357,045

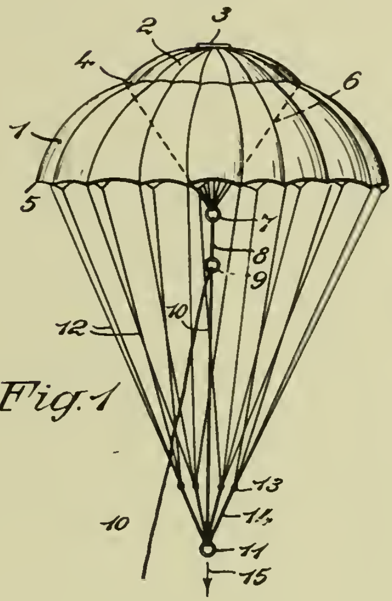
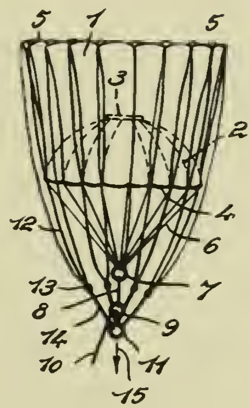


Fig.1

Fig.2



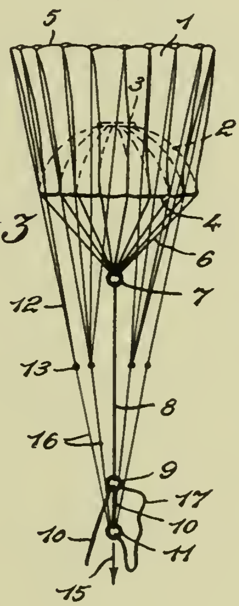
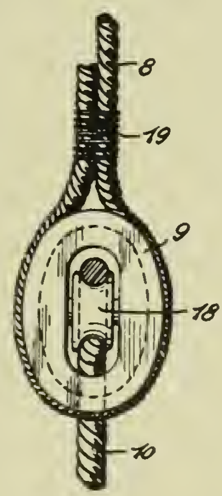


Fig.3

Fig.4



Inventor:
G. Lisi
By E. F. Wendroth
Atty

Published May 25, 1943

Serial No. 357,989

ALIEN PROPERTY CUSTODIAN

PROCESS FOR PRODUCING OF CATALYSTS

Heinrich Brendlein, Frankfurt (Main)-Ginnheim, Germany; vested in the Alien Property Custodian

No Drawing. Application filed September 23, 1940

The present invention relates to the production of a new and useful catalyst especially suitable in the field of generally spoken heterogene catalysts, e. g. in synthetic processes, oxidation reactions, reduction-processes, splitting-off as well as hydrogenation or dehydrogenation. The new catalysts are especially suitable for the production of mixed catalysts which contain metals or metal oxides, or metal salts.

The use of metals as catalysts is known. These may be produced by converting the salts into the oxides or by reducing the oxides, produced in any way. The obtained finely divided metals may be brought up on carriers. Catalysts brought up on sized carriers are especially suitable in the continuous working. Tube furnaces may be charged with the granular catalysts and the materials which are to be reacted are passed over.

It is known to obtain granulated catalysts in such manner that from an alloy of a catalysing metal, e. g. for the hydrogenation, and an other metal, the latter is wholly or partially eliminated. To carry out hydrogenation reaction, nickel-aluminium alloy in various compositions are particularly suited, whereby the aluminium is eliminated by caustic soda or soda solution.

Hereby it is useful to granulate the alloy in parts of the desired size before the alkaline treatment. In this manner the catalyst itself serves as a carrier. Only the surface of the catalyst is active and not the inner parts of the same consisting of expensive material.

The present invention relates to the production of a highly activated catalyst in granular form which is suitable in continuous working, whereby in the contrary to the known catalysts not only the surface, but also the whole catalyst is in operation.

This is advantageous in view of the fine division and the complete utilization of the whole catalyst material. For this purpose the catalytic substance is deposed on e. g. a porous carrier in finely divided form, but not as an impermeable coating. The catalysts have the advantage that their outside and inside are likewise active in such manner that by the reaction, e. g. the hydrogenation, the entrance respectively the throughput through the whole catalyst body is possible. The contact substance, such as metal, metal salts, alloy etc. may be sprayed on the carrier. The granular carrier material may also be introduced or stirred in the melted or liquid contact substance.

A granular carrier material of the desired size is given into a shaking device or in a roll provided with a sieve, which is rotated, or similar apparatus. The meshes of this sieve have a size which prevents the carrier from falling out. The roll on the shaking device is slowly moved. The contact mass is then sprayed on the carrier.

In accordance to the invention e. g. a nickel-aluminium-alloy may be sprayed up.

By use of a suitable degree of rotation of the sieve roll it is possible to coat the carrier with a complete thin film of alloy. Various substances may be used as carrier, e. g. sized clay, pumic stone, silicagel, asbestos, activated carbon; metals such as iron, nickel, aluminium, whereby the latter are preferably used in the form of Prym-rings.

The contact carriers such prepared is treated with diluted caustic soda to eliminate the wholly or partially aluminium. Thereupon the carrier is washed by hot water. The activated contact is finally preserved in alcohol until use. In contact with the air the catalyst undergoes oxidation under spontaneous glowing.

The contact in accordance to the present invention may be also produced by spraying the contact substance on porous carrier plates or in any other way of coating, whereby a porous layer or coating of alloy arises. In every case the treated carriers are freed from one constituent e. g. aluminia by treatment with suitable solvents, e. g. caustic soda, in order to obtain porous surfaces. Such plates may be sized to a desired degree. The preparation, especially the reduction of the proper contact matter may be performed before or after its spraying onto the carrier. The preparation of e. g. iron oxide containing catalysts may further be performed by spraying molten iron onto carriers, whereby oxidation of the iron occurs. The spraying or impregnation may be done e. g. in hydrogen or in any reducing gases material. On the other hand the contact may first be heated in any reducing gas and afterwards treated with suitable solvents in order to eliminate one of the constituents e. g. aluminium. Oxides or salts of catalytic active metals may also put on the carrier by working in the heat. It happens some time that the solvents like sodium or potassium hydroxide can not be wholly eliminated from the catalysts even after several extracting with boiling distilled water. Traces of said solvents respectively alkaline matter are however in most cases not at all undesired. In the contrary e. g. in hydrogenation processes the content of little quantities of alkaline matter exert a promoting effect.

When the catalyst according to the present invention lessens in activity it may be reactivated in known manner. To this end, however, it is preferable to treat the catalyst with suitable solvents as stated above and afterwards to heat in any reducing gas. The catalysts may also be reactivated solely by washing out with lye and hot water.

HEINRICH BRENDLEIN.

Published May 25, 1943

Serial No. 358,686

ALIEN PROPERTY CUSTODIAN

RONTGEN TUBE WITH ANODE TURNING ABOUT ITS LONGITUDINAL AXIS

Kurt Schwarzer, Berlin N 65, Germany; vested in the Alien Property Custodian

Application filed September 27, 1940

The invention relates to a novel Röntgen tube with anode turning about its longitudinal axis and equipped with two anodes, two-cathodes and synchronous drive for both anodes so that, when the tube is directly connected to an alternating current-high tension, both half-cycles are utilized for the production of Röntgen rays originating at the same point of space. By the Röntgen tube according to the invention, the rectifier connections with four high tension incandescent cathode rectifiers, used up to the present in all high power Röntgen arrangements, become superfluous, so that the Röntgen arrangements become much simpler and cheaper.

The two anodes are preferably constructed as half rotary bodies of substantially similar shape and oppositely directed arranged rotatable in the same space portion with corresponding coordination of a cathode to each anode. A synchronous motor may be provided as drive for each anode. The drive may, however, be effected by one single synchronous motor, the two anodes being then connected the one with the other by a coupling piece possessing high insulating capability and heat constancy, for instance of quartz glass. Also in this coupling it is advisable to balance each anode alone relative to the turning axis in order to avoid too great mechanical stressing of the coupling piece.

A Röntgen tube according to the invention shown by way of example partly diagrammatically in the accompanying drawing, in which

Fig. 1 shows a longitudinal section through the tube and

Fig. 2 is a top plan view on the anodes corresponding to the section line II—II in Fig. 1.

In the high vacuum envelope 1 of the Röntgen tube, said envelope consisting preferably of glass, a bearing 2, 3 respectively is inserted at the two ends each with ball bearings, for the pivot axles, 4, 5 of the two anodes 6, 7. The anodes are coupled the one with the other by an insulating piece 8 made for instance of quartz glass. Each anode is balanced alone relatively to its turning axis by means of balancing bodies 9, 10. A motor making 3000 revolutions per minute (alternating current of 50 periods being supposed) is provided, the stator of this motor being designated by 11 and the rotor mounted on the turning axle 4 by 12. An incandescent cathode 13 is coordinated to the anode 6, the filament voltage being fed to said cathode through the intermediary of metal seals 14, 15 of the high vacuum envelope. The incandescent cathode 16 with the metal seals 17, 18 belongs to the anode 7.

When building up the Röntgen tube according to the invention the anode 6 and the incandescent cathode 16 in the one half-cycle have positive potential and the anode 7 and the incandescent cathode 13 have negative potential. In the other half-cycle the potential distribution is inverse. In the anode position shown in the drawing the incandescent cathode is negative, the anode 7 positive and Röntgen rays are emitted from the tube to the left. In the next half-cycle the anode has turned by 180°, the incandescent cathode 13 is negative and the anode 6 positive, so that Röntgen rays are emitted from the same in the same direction. The position of the burning point in the space remains unchanged.

KURT SCHWARZER.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

K. SCHWARZER
RONTGEN TUBE WITH ANODE TURNING
ABOUT ITS LONGITUDINAL AXIS
Filed Sept. 27, 1940

Serial No.
358,686

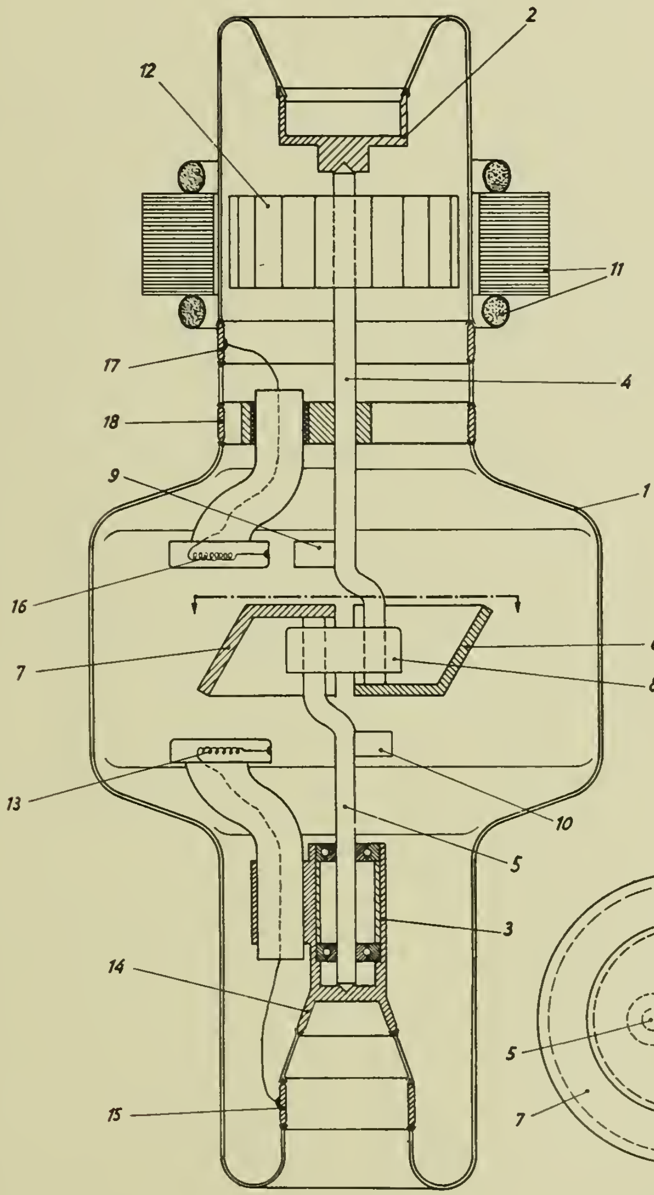


Fig. 1

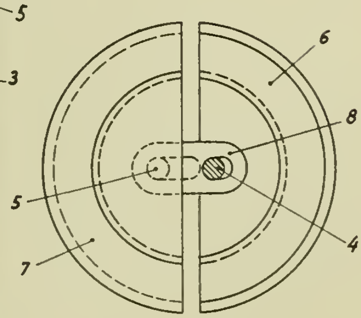


Fig. 2

Inventor:
Kurt Schwarzer
by [illegible]
his Attorney

Published May 25, 1943 Serial No. 358,731

ALIEN PROPERTY CUSTODIAN

WING FOR AIRCRAFTS WITH A VARIABLE SURFACE EVEN DURING THE FLIGHT

Giovanni Pelessoni, Udine, Italy; vested in the Alien Property Custodian

Application filed September 27, 1940

The present invention relates to a wing for aircrafts, characterised in that the wing surface may be varied at will both on earth and during the flight.

The possibility of varying the carrying or lifting surface of a wing before and during the flight offers remarkable advantages to aerial navigation as for instance in the following cases.

(A) During the flights at great distance, characterised by the quantity of fuel at disposal on the aircraft at the moment of start, said fuel being absorbed by the power during the flight thus diminishing the weight of the same fuel on the aircraft so that after a certain time the wing surface is in exuberance, the possibility in this case to reduce the lifting surface during the flight allows a remarkable and progressive increase of speed to the aircraft and at the same time to reach the destinations prefixed in a remarkably shorter time.

(B) In the aircrafts with the charge of a high lift wing section obliged to a long running for starting, the possibility to increase the wing surface diminishes the lifting coefficient thus the starting of the aircrafts being remarkably facilitated.

(C) In the aircrafts flying at a top speed obliged to land at a high speed, the possibility to increase the wing surface during the flight removes all the systems of oversustentation studied for deforming the profile in order to modify the air flux all around and to brake the aircraft at landing.

In the accompanying drawing the Figures 1 and 2 show schematically the complex of the wing in the position of maximum and minimum surface which may be obtained.

Fig. 1 shows the profile of the wing with the maximum surface obtained running from the leading edge **24** to the trailing edge **22**, said surface being obtained by the displacement of the half wings **1** and **21** occurred from B to A for the fore one and from C to D for the back one **21**.

Fig. 2 shows the profile of the wing with the two half wings **2** and **21** completely retired, the wing having the minimum lifting surface.

The wing is subdivided into two parts: the one fixed, the other moveable.

The fixed part going from B to C comprises the longerons **5** and **17**, the fixed ribs **23** and the half ribs **19**. In said part there are to be found all the functioning members for the variation of the wing surface.

The moveable part comprises the half wings **1** and **21**.

The fore half wing **1** with the leading edge **24** comprises the fixed ribs **2**, the half ribs **3** and the screw-axle **4** with rack **11**, with said axle all the parts mentioned forming a single body.

The back half wing with the trailing edge **22** comprises the rib **21**, the sliding covering **20** and the axle **18** with rack **15**, all the parts mentioned forming with this axle a unique body.

Fig. 3 shows the motion transmitting axle **6** running longitudinally through the wing with worm gears **7**, screw wheels **8**, screw axles **4**; while the screw group **26** and **25** and the electric motor **27** are placed within the fuselage with the electric battery **28** and the control for the wing surface variation comprising the three-way switch **29**.

The device is actioned by the electric motor **27** placed in the fuselage and fed by the electric battery **28**.

The control device comprises the three-way switch **29**:—the neutral position N, the left position S, the right side position D.

According to position S the electric motor rotates in the left handed direction and according to position D in the right handed one.

The electric energy of the battery **28** is transmitted over the switch **29** to the electric motor **27**, this motor making the worm wheel **25** rotate which is engaged with the screw wheel **26** fixed on the transmitting shaft **6**. On this shaft **6** there are fixed the worm wheels **7** each being in engagement with a screw wheel provided with a screw hole **8**.

In such a way the number of revolutions of the electric motor **27** is transmitted strongly diminished to the screw wheels **8**, which, since they are obliged to rotate on their own axles, the thrust bearings **9** preventing them from executing a motion of translation, oblige the screw axles **4** in engagement with them to be displaced forwards and backwards longitudinally according to the sense of rotation communicated to the electric motor **27** by the switch **29**. Owing to the interposition of the tooth wheel **14** rotating on the pin **12**, between the racks **11** and **15** fixed on the axles **4** and **18**, obliges the axle **18** to be displaced in the opposite sense of the axle **4**.

In this way the speedy rotary motion of the electric motor **27** has been transformed into the slow rectilineal motion of the half wings **1** and **21** by means of the axles **4** and **18** with which said half wings form a unique body.

The device also comprises an automatic stop allowing to stop the stroke of the half wings

when they have reached the maximum or the minimum of their stroke.

The irreversibility of the half wing motion is secured by the screw and the helicoidal groups.

All wing surface variations are obtained at will as well on earth as in any other circumstance of flight without displacing the position of the centre of gravity of the aircraft with respect to the wing and its centre of pressure.

The motion of the half wings may be obtained with any other possible device and different from the one described and illustrated only by way of example.

GIOVANNI PELESSONI.

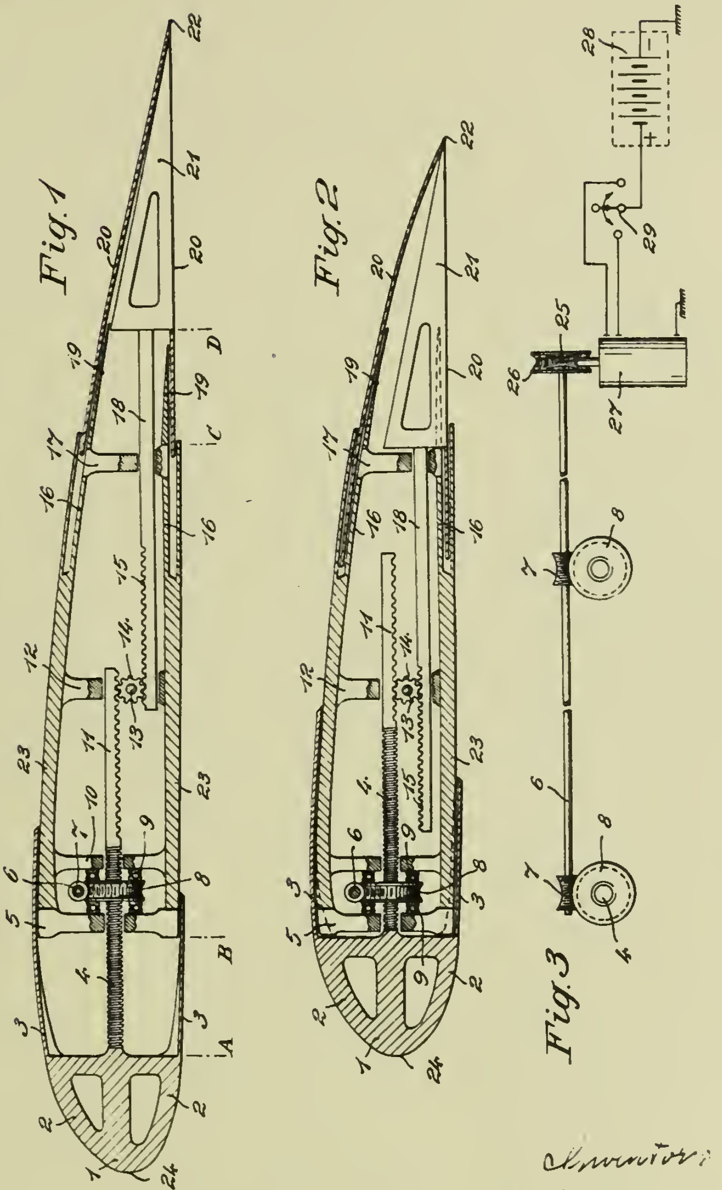
PUBLISHED

MAY 25, 1943.

BY A. P. C.

G. PELESSONI
WING FOR AIRCRAFTS WITH A VARIABLE
SURFACE EVEN DURING THE FLIGHT
Filed Sept. 27, 1940

Serial No.
358,731



Inventor:
G. Pelessoni
by F. F. Wendroth
Atty

Published May 25, 1943

Serial No. 359,171

ALIEN PROPERTY CUSTODIAN

METHOD OF PRODUCING FOAM BATHS

Leo Löwenstein, Berlin-Wilmersdorf, Germany; vested in the Alien Property Custodian

No Drawing. Application filed September 30, 1940

The present invention relates to a method of producing foam baths.

As is well known, foam baths which are of considerable importance for various medical purposes are made in such a manner that hot water of a temperature of more than 40° C. containing a foam former, for instance saponine, is poured into a bathing-tub to a height of 5–10 cm and small air bubbles from a compresser are, by way of a distributing plate led through this water. This so-called air foam then has a temperature of 30–35° C. Such a foam, however, is very unstable, particularly at higher temperatures. It has, therefore, also been tried to obtain a better stability or permanence of the foam by incorporating solid particles.

The sanative or curative effect of the foam baths substantially depends on the heat accumulating effect of same. Due to this heat accumulating effect a sufficiently high temperature of the foam is maintained for a sufficient long duration of time, i. e. for the duration of a bath that is to say up to 20 minutes. Now, it has been found that from this point of view the above mentioned baths using air foam do not answer the purpose. It has already been proposed to embed aluminae in the air foam used for bathing purposes in order to render the foam more stable. A useful result, particularly with regard to the heat accumulating effect, however, has not been obtained. Foam baths, based upon a chemical conversion, particularly baths with dry foam are more suitable.

A chemical preparation of foam without special devices is rendered possible by conversion of aluminium salt, particularly sulfate, with alkali carbonate, particularly sodium bicarbonate, which are inserted into water containing a foam former and then producing foam by the development of carbon dioxide. Hereby the following conversion is effected.

$$Al_2(SO_4)_3+6NaHCO_3=2Al(OH)_3+3Na_2SO_4+6CO_2$$

The aluminium hydroxide developed during this reaction is uniformly distributed in the form of a colloidal gel over all the walls of the foam structure and also between the individual bubbles.

For the production of a chemical foam bath it has also been proposed to use as much water only as may be practically retained by the finished foam, i. e. less than 300 cm³ of water for 10 g of $NaHCO_3$. This foam is more stable than the above mentioned foams even at higher temperatures. In such a foam, dry foam, temperatures up to 55° C may be endured by a person taking the bath.

Now the invention relates to a method of producing foam which allows a particularly strong accumulation of heat or which has a very low heat conductivity respectively. According to the invention solid small particles and pulverized substances respectively are added to foam forming mixtures of aluminium sulfate and bicarbonate of sodium, whereupon, by stirring with a sufficient quantity of water of a corresponding temperature, a foam is obtained in which besides the aluminia gel the solid particles are incorporated. Only as much water is to be used as practically may be retained by the foam produced.

Moreover, preferably the amount of solid pulverized substances by weight should not exceed more than 40% of the weight of the $Al_2(SO_4)_3$ contained in the mixture. So for instance ordinary industrially pure aluminia or aluminia hydrate is admixed, not more than 40% of the $Al_2(SO_4)_3$ being contained in the mixture as powder of aluminium oxide or aluminium hydroxide. If then by stirring with water foam is produced by means of a foam former, for instance saponine, this foam is of considerably larger heat accumulating capacity than any one of the known foams proposed for the production of foam baths.

Instead of aluminia, magnesium oxide or magnesium hydroxide may be added to the mixture. In place of these substances, other solid particles also may be embedded which by themselves are not heat conducting and are chemically inert with regard to the other constituents of the mixture. Pulverized bath muds, for instance fango, a material originating from the deposit of springs or of volcanic earths, river-, sea-, or marine-mud, have proved to be particularly suitable. In all cases, however, it is necessary that in the mixture the quantity of $Al_2(SO_4)_3$ by weight is at least three times as large as the weight of the admixed solid substances. For the production of this foam no more water may, of course, be used as may be retained by the foam. The water used for producing the foam is not allowed to exceed a maximum quantity which amounts to 400 cm³ for each 7 g of $Al_2(SO_4)_3$. In the explanation, therefore, pure $Al_2(SO_4)_3$ without crystal water is supposed to be used.

Below some compositions of suitable mixtures for the production of such baths are given.

		G.
1.	$Al_2(SO_4)_3.18$ aq	1718
	$NaHCO_3$	1300
	Al_2O_3	195
	Saponine	30
2.	$Al_2(SO_4)_3.18$ aq	1718
	$NaHCO_3$	1300
	MgO	77
	Saponine	30
3.	$Al_2(SO_4)_3.18$ aq	1718
	$NaHCO_3$	1300
	MgO	154
	Saponine	30
4.	$Al_2(SO_4)_3.18$ aq	1718
	$NaHCO_3$	1300
	Fango	195
	Saponine	30

The mixtures are so chosen that about 190 liters of dry foam, i. e. foam practically without adherent water result from each 30 liters of water, i. e. the filling of an ordinary bathing-tub.

The mixtures contain 933 g of $Al_2(SO_4)_3$. The total weight of the admixed powder, therefore, is not allowed to amount to more than 373 g. Otherwise the foam would considerably lose its stability and capacity of heat accumulation.

Now, these foams have been tested with regard to their capacity of heat accumulation. For this purpose the foam was filled into a glass bulb having a connecting socket. After filling the socket was closed by means of a perforated plug through which a thermometer extended into the bulb in such a manner that the mercury ball was situated in the centre of the glass bulb. The latter was totally dipped into a water bath the temperature of which could be maintained constant. The foams were filled in with a temperature of 12°, while the temperature of the water bath amounted to 50°. The rise of temperature in the bulb was then observed at various periods of time. The quicker the temperature rises to 50°, the better is the heat conductivity and the worse is the heat accumulation.

In the following table the temperatures of the four foams are indicated which are read off after 5, 10, 15 and 20 minutes respectively.

	Temperature of foam in Celsius degrees after—			
	5 minutes	10 minutes	15 minutes	20 minutes
Foam 1, with 195 g Al_2O_3	12	12	19	33
Foam 2, with 77 g MgO	12	12	17	30
Foam 3, with 154 g MgO	12	12	18	29
Foam 4, with 195 g fango	12	12	20	31

For comparison the heat accumulation of the above mentioned known foams was measured under the same conditions. Air foam produced by forcing air into saponine containing water by means of a filter having small pores (tower of alumina ultra D) was examined. Further, air foams produced in the same manner, having solid particles incorporated, were tested. Before forming the foam 1,5 or 4 g of Al_2O_3 or 1,2 g of MgO were added into the suspension for each 100 cm³ of water.

Moreover, a dry foam, as proposed already and obtained by the conversion of $Al_2(SO_4)_3.18H_2O$ with $NaHCO_3$ with a small quantity of water was examined.

An ordinary fango mud having 1,5 kg of fango in 0,6 kg of water also was examined.

	Temperature of foam in Celsius degrees after—			
	5 minutes	10 minutes	15 minutes	20 minutes
Air foam	35, 7	50	50	50
Air foam with 1,5 g Al_2O_3	33, 5	50	50	50
Air foam with 4 g Al_2O_3	35	50	50	50
Air foam with 1,2 g MgO	32	50	50	50
Dry foam obtained by conversion	12	15	30	45
Fango mud	13	21	29	36

A comparison of the two tables shows that baths prepared in accordance with the method of the invention are, as far as their accumulation of heat is considered, far superior to hitherto known foam baths. They come, however, also up with fango.

It is still to be noted, that the foams produced in accordance with the method of the invention are, as far as stability comes into consideration, far superior to air foam and are at least of equal quality as dry foam. With regard to the latter, foams prepared according to the method of the invention have the advantage that they may cheaper be produced as for instance alumina is considerably cheaper than the corresponding amount of aluminium sulfate and bicarbonate, which are saved. Another advantage with regard to known dry foam baths consists in this that the packed mixture of the latter quickly forms lumps, whereas the new baths remain in the form of a powder for many months.

This progress over known foam baths also results in the superiority of the foam bath to the mud-bath. Such baths may be taken in special health resorts using complicated devices. Due to the high specific weight, the baths exert a higher pressure on a human's body than a water bath. The new foam bath, however, may very easily be taken in any bathing-tub even in private-houses. The pressure acting upon the body amounts to about a fraction of the pressure of an ordinary water bath only. Effective colloids and salts of the mud may easily be incorporated in the foam.

LEO LÖWENSTEIN.

Published May 25, 1943

Serial No. 359,941

ALIEN PROPERTY CUSTODIAN

CONTROL MEANS FOR AIRCRAFT WING FLAPS

Carlo Gliubich, Milan, Italy; vested in the Alien Property Custodian

Application filed October 5, 1940

It is known that in aeroplanes and aircrafts generally the wings are provided with wing flaps which are adjusted into different positions in accordance with conditions of landing, taking off and normal flight; it is known to use a service-motor for the actuation of said wing flaps and particularly a reversible electric motor operative to adjust said wing flaps into their several required positions under the pilot control.

This invention has for its object a device for the control of the wing flaps of aircraft wings which is able to effect automatically the control and actuation of wing flaps when the aircraft has reached a predetermined speed and, more particularly, to adjust said wing flaps into their normal flight position from their taking off position on the aircraft reaching a predetermined speed.

In this invention the service motor or electromotor which actuates said wing flaps is subject to a control responsive to the aircraft speed and causing the service motor to operate as necessary to adjust said wing flaps into their normal flight position on the aircraft reaching a predetermined speed.

The speed responsive device may include a Pitot tube or a Venturi tube or a centrifugal governor operated by the flying or relative wind stream; the actuation of the wing flaps may be effected by means of an electromotor or a service motor of any appropriate class.

An embodiment of this invention is hereinafter described by way of example with reference to the annexed drawing in which:

Fig. 1 illustrates diagrammatically an arrangement in accordance with this invention with a Pitot tube control device and reversible electric motor actuating means;

Fig. 2 shows diagrammatically the section of a wing with a wing flap cooperating therewith, this wing flap being shown in full line, in dotted line and in chain line in the several positions it may be carried in.

In the illustrated embodiment, 1 denotes the rotor of a reversible electric motor M intended to actuate the wing flap 2 of a wing 3 (Fig. 2) of an aircraft by means of a drive of any suitable class, not shown, which may include a drum actuated by said rotor 1 and ropes operated by said drum and actuating said flap 2 or a gear drive including worms, worm wheels and shafts; the motor M includes two field windings 4, 5 for its operation in reverse directions said windings being adapted to be connected alternatively by means of conductors 6 and 7 and 15, with one terminal of a supply battery 8 by means of relays including coils 9, 11 and armatures 10, 12 which are urged by springs 13 into their open-circuit positions; the feeding circuit of the motor M is completed through the rotor 1 and a conductor 14 which leads to the opposite terminal of the battery 8.

The relay coils 9, 11 have one end connected in common with a conductor 15 and a terminal of the battery 8. and they are controlled by means of a controller 16 whose quadrant contact 17 is connected with the terminal of the battery 8 opposed to that from which the conductor 15 leads; this connection of the quadrant contact 17 with the respective terminal of the battery 8 is provided by means of conductors 18, 19 in which a switch denoted in its whole by 39 is inserted as hereinafter described.

The opposed ends of the coils 9, 11 are connected with contacts 20 and 21 of the controller 16 which correspond respectively to the positions of the wing flaps for the normal flight and for landing (said positions being referenced 2° and 2'' in Fig. 2) by means of leads 22, 23 and 24, 25 in which the end-stroke stop switches 26, 27 are inserted, respectively, these switches being usually cut-in and being adapted to be moved into cut-out position by the respective cam arms 28, 28' under the action of the actuating means for the wing flap 2 at the time it takes its normal flight position and its landing position, respectively.

The controller 16 includes a third contact 29 for the taking off position of the wing flap, said position being intermediate the normal flight position and the landing position and being shown at 2' in Fig. 2; said contact 29 is connected by the lead 30 with movable contacts 32, 32' of a double switch 31 whose stationary contacts 33, 33' are connected with the relay coils 9 and 11 by the leads 34, 23 and 34', 25, respectively.

A cam arm 35 operating the movable contacts 32, 32' of the switch 31 is actuated by the wing flap drive to open the contacts 32, 33 and 32', 33' at the time the wing flap 2 is in its taking off position while at the time said flap 2 passes from its normal flight position to its taking off position or vice-versa, said contacts 32', 33' are closed and said contacts 32, 33 are held open; the contacts 32, 33 are held closed and the contacts 32', 33' are held open during the passage of the flap 2 from its taking off position into its landing position and vice-versa.

The actuation of arms 28, 28', 35 by the flap

drive may be obtained by cam means (not shown) actuated by a member of the drive intermediate the rotor **1** of the motor M and the wing flap **2**, in well known manner.

The quadrant contact **17** of the controller **16** is bridged selectively with any of the contacts **20**, **21**, **29** by means of a wiping contact **36** actuated by the operator by means of the handle **37** fast on the spindle **38** having in turn said contact **36** fast thereon; in the 0-position of said wiping contact **36** all the circuits are disconnected.

The device of this invention intended to cause the wing flap **2** to pass automatically from its taking off position to its normal flight position at the time the aircraft has reached a predetermined speed, includes the switch **39** having two stationary contacts **40**, **41** which are connected respectively with the lead **18** leading to the quadrant contact **17** of the controller **16** and with the lead **42** connected with the lead **22** which connects the normal flight controller contact **20** with the movable contact of the stop switch **26** for normal flight; a movable contact **43** fulcrumed at **44** in the switch **39** is connected with the lead **19** which in turn is connected with the supply battery **8**, and is actuated by a device responsive to the aircraft speed.

In the illustrated embodiment the aircraft speed responsive device includes a Pitot tube comprising a tube **45** pointing towards the flight direction and having orifices **46**, **47** at its ends for the flow of air therethrough; the tube **45** is connected by means of a duct **48** with an expansible bellows **49** which controls the movable contact **43** of the double switch **39** by means of a rod **50**. The bellows **49** is located within a sealed casing **60** which is connected by a duct **51** with a chamber **52** which in turn opens in a tube **54** pointing towards the flying wind or flight direction through an air flow damping labyrinth or air pervious partition **53**.

The air pressure operative within the bellows **49** during the aircraft flight through the tube **45** and the duct **48**, has a value correspoding with a total pressure being the sum of the static air pressure and of the flying speed generated dynamic pressure, while the air entering the chamber **60** through the tube **54**, chamber **52** and duct **51** and operative in said chamber **60** after its full dynamic energy has been lost through the partition **53**, generates a pressure which corresonds with the static air pressure. Consequently the action of the bellows **49** on the rod **50** and movable contact **43** depends upon the aircraft speed and said bellows by effect of its own resiliency keeps the contact **43** forced on the contact **40** until the pressure operative therein and consequently the aircraft speed are below a predetermined value, whilst when the air pressure overcomes said value within the bellows **49** said bellows **49** expands to cause the contact **43** to release the contact **40** and to engage the contact **41**.

As above suggested any other device responsive to the aircraft speed and adapted to control the movable contact **43** in a manner depending upon the aircraft speed may be used in lieu of the above described device.

In operation, at the time the wing flap **2** has been adjusted into its landing position 2'' from its normal flight position **2** and the contact **36** has been carried on to the contact **21**, the circuit of the relay **11** is open at the stop switch **27** and the circuit of the relay **9** is closed as follows preparatory to the flap passage into its taking off position: contact **29**, lead **30**, contacts **32** and **33** in closed position, leads **34** and **23**, relay **9**, conductor **15**, battery **8**, lead **19**, contacts **43** and **40** which are held interengaged by the bellows **49** wherein no dynamic pressure is operative in the assumed conditions, lead **18** and quadrant contact **17**; on the wiping contact **36** being moved onto the contact **29** the relay **9** is energised which causes its armature contact **10** to close and consequently causes the battery **8** to supply the circuit **8**, **14**, **1**, **4**, **6**, **10**, **15** of the motor M which is thus made operative in a direction to cause the wing flap **2** to move from its landing position 2'' into its taking off position 2' (Fig. 2).

On the wing flap **2** reaching its taking off position 2' its drive operates the arm **35** of double switch **31** to separate contacts **32**, **33**; then the energization of the relay **9** is cut out and the motor M comes to rest, while a circuit intended to energize the relay **9** to cause the further operation of the motor M in the same direction as that of the above described operation to adjust the wing flap **2** into its normal flight position 2° is prepared as follows: **20**, **22**, **26** (closed), **23**, **9**, **15**, **8**, **19**, **43**, **40**, **18**, **17**; accordingly the wing flap **2** may be caused to take its normal flight position from its taking off position by bringing the wiping contact **36** of the controller **16** onto the contact **20**, thus causing the energisation of the relay **9** and closing the armature contact **10** of the motor supply circuit.

On the other hand, due to the described arrangement, the energisation of the relay **9** is also prepared by the circuit **8**, **19**, **43**, **41**, **42**, **26** (closed), **23**, **9**, **15** this circuit standing open at the contacts **43**, **41** until the bellows **49** causes the movable contact **43** to separate from the contact **40** and to engage the contact **41** as an effect of the dynamic pressure operative in said bellows **49** due to the speed the aircraft has reached.

Consequently, after the contact **36** of the controller **16** has been adjusted in flap taking off position, the wing flap **2** is caused to take its normal flight position 2° automatically as soon as the aircraft has reached a speed at which the engagement of the contacts **43**, **41** occurs under the action of the dynamic air pressure operative within the bellows **49**; on the other hand the adjustment of said wing flap into its normal flight position 2° may be caused in any case and at any time by an operator by bringing the contact **36** over the normal flight contact **20**.

At the time the wing flap **2** moves from its taking off position 2' to take its normal flight position 2°, the contacts **32'**, **33'** are closed and on said flap **2** reaching its normal flight position 2° the cooperating stroke end switch **26** opens, to cut in any case the energisation of the relay **9** both when the circuit of this relay has been closed automatically at contacts **41**, **43** and when said circuit has been closed under an operator's action bringing the contact **36** in engagement with the contact **20**; the flap is accordingly held in its normal flight position.

In this position a circuit adapted to energise the relay **11** to supply current to the motor M to bring the wing flap **2** into its landing position 2'' is prepared as follows: **21**, **24**, **27** (closed) **25**, **11**, **15**, **8**, **19**, **43**, **40**, **18**, **17**, **36** and it stands open until such time as the aircraft speed has dropped below the normal flight position. Of course a speed reduction occurs before the aircraft is put in conditions for landing; on such

a speed drop occurring the bellows 49 moves the contact 43 into engagement with the contact 40 as an effect of the drop of the dynamic pressure within it, said bellows 49 and contacts 43, 40 thus preparing the circuit of the relay 11 which is energised at the time the operator brings the contact 36 on the landing contact 21; the armature contact 12 thus moves at this instant to set the circuit 8, 14, 1, 5, 7, 12, 15 in conditions to supply the motor M for its operation in such direction as necessary to adjust the wing flap 2 into its landing position 2''.

At the time the wing flap 2 reaches its landing position 2'' the switch 27 is brought into its circuit opening condition and the circuit of the relay 11 is cut out.

CARLO GLIUBICH.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

C. GLIUBICH
CONTROL MEANS FOR AIRCRAFT WING FLAPS
Filed Oct. 5, 1940

Serial No.
359,941

Fig. 1

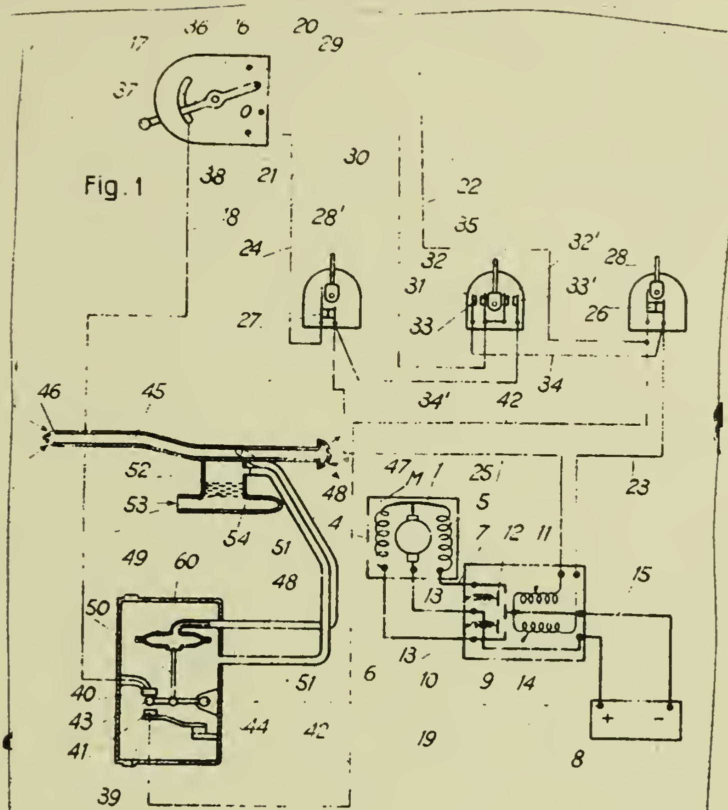
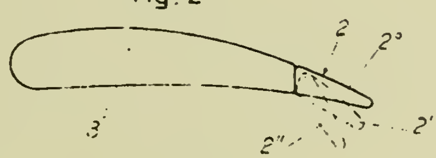


Fig. 2



Inventor ~~Attorney~~
C. Gliubich
By
E. F. Wenderoth Atty. ~~Inventor~~

Published May 25, 1943 Serial No. 359,951

ALIEN PROPERTY CUSTODIAN

ELECTRON TUBES

Heinz Schmellenmeier, Berlin, Germany; vested in the Alien Property Custodian

Application filed October 5, 1940

The leads to the electrode system of electron tubes may be arranged to extend through the glass bulb or envelope surrounding the electrode system. Also, some of the leads may be supported by a separately manufactured glass portion or bottom, while the other leads are sealed into the glass bulb. After finishing the electrode system the bulb is inserted over the electrode system and then sealed to the bottom.

In this connection the practice has been to seal into the bulb, before inserting it over the finished electrode system, those leads which the bulb is to carry, and then to join these leads to the electrodes fastened to the botom. In most of these cases it must suffice that the leads merely contact with the electrodes instead of being fixed thereto, since it is difficult or impossible to interconnect them by soldering, welding or screwing, there being no space for the insertion of the requisite tool.

Another method of providing the bulb with inleads consists in fixing these to the electrode system, as by welding, and then uniting them with the glass bulb in the manner described hereafter, namely: the leads are inserted in tubular extensions of the glass bulb and are sealed in these extensions at the end thereof. For this purpose the leads may be fitted with a glass bead. This method, however, involves the use of comparatively long leads and therefore is disadvantageous especially where short or ultra-short waves are concerned. In addition, the tubular extensions of the bulb are a source of danger since they are easy to destroy. This method is nevertheless much used as other proposals have not been successful for the reason that glass is liable to destruction.

The present invention aims to overcome these difficulties and consists in certain features of novelty which will appear from the following description and the accompanying drawing, in which

Fig. 1 is a partially diagrammatic view showing an electron tube whose inleads are fastened in the manner provided by the invention, Fig. 2 is a partially diagrammatic sectional view of a second form of such an electron tube, Fig. 3 is a fragmentary view that illustrates the method of producing the seals shown in Figs. 1 and 2.

1 denotes the bulb, 2 the bottom, 3 the leads to the electrode system 4, while 5 indicates the seals by which the leads are held in position. Bulb 1 and bottom 2 are preferably made of glass.

The seals 5 are provided inside the vessel so as to form no raised portions on the outer side thereof.

In order to achieve this the bulb 1 and bottom 2 are provided with holes, such as hole 6, Fig. 3. Hole 6 is by way of example shown to be provided in the bulb 1. Such holes are three or four times larger in diameter than the leads 3. Fig. 3 represents the upper part of Fig. 1 in the state of sealing the lead 3 thereof into bulb 1.

The leads 3 before fixing them to the finished electrode system 4 are fitted with a properly positioned glass bead 5′, Fig. 3. The leads are then fastened to the electrode system by welding or in any other suitable manner. Thereupon the bulb provided with hole 6 is inserted over the electrode system with the respective lead 3 reaching through the hole 6. The bulb is in this way so positioned that the bead 5′ is outside flush with the outer surface of the bulb, as will be seen in Fig. 3. The lead is held in position either by securing it rigidly to the electrode system or by means of a holding device located outside. The vitreous material around hole 6 is then warely heated to the softening temperature and melted with the bead 5′ so as to form the upper seal 5, Fig. 1.

The seals 5 pertaining to the bottom leads 3, Figs. 1 and 2, and the lateral seal 5 in Fig. 2 are produced in a manner analogous to that just described.

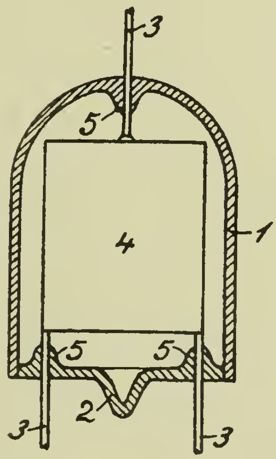
HEINZ SCHMELLENMEIER.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

H. SCHMELLENMEIER
ELECTRON TUBES
Filed Oct. 5, 1940

Serial No.
359,951

Fig. 1



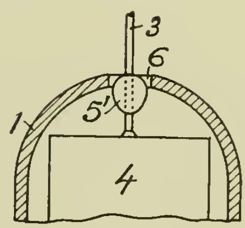
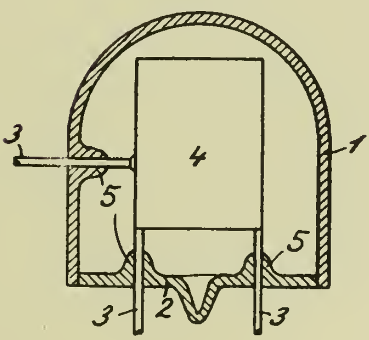


Fig. 3

Fig. 2



Inventor:
Heinz Schmellenmeier
by [signature]
Atty

Published May 25, 1943 Serial No. 359,952

ALIEN PROPERTY CUSTODIAN

ELECTRON TUBES

Felix Herriger, Berlin, Germany; vested in the Alien Property Custodian

Application filed October 5, 1940

This invention is an improvement upon electron tubes of the kind described in the copending patent application of Robert Herzog, Serial No. 295,083, filed September 15, 1939, and will be understood from the following description, reference being had to the accompanying drawing, which shows a longitudinal section of an example of tubes improved in accordance with the invention described hereafter.

In this drawing, 1 denotes the bulb of a vacuum vessel. The bulb is preferably of metal and has a flanged enlargement 2 in which an insulating disc-shaped member 4, preferably of ceramic material, is positioned. 5 indicates a disc made of moulded glass and sealed to the enlargement 2 in well known manner. In the disc 5 enlargements 6′ of conductors 6 are embedded. The conductors 6 are the leads to the electrode system 7. They extend through member 4 in order to be held by it in the proper position when the disc 5 is being sealed to the bulb 1, 2 and thus softened.

In the prior arrangement, disclosed in the said co-pending application, disc 5 and member 4 are spaced apart so that there is a clearance between the two. During the sealing operation, that is, when the disc 5 is softened the assembly 5, 6′, 6, 7 is supported by the member 4 contacting with the enlargements 6′.

According to the present invention member 4 is arranged to contact over its entire outer end face with the inner end face of the disc 5, as shown, so that the disc 5 when sealing it to the bulb 1, 2 will be sealed also to the member 4.

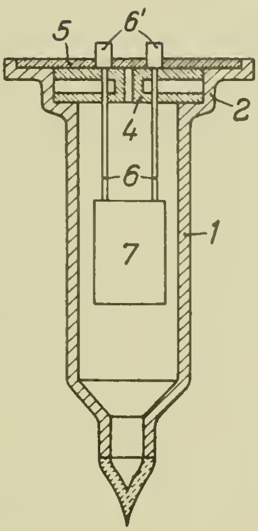
The invention combines the simple manufacture of the glass disc 5 with the advantages due to the supporting member 4. In the novel arrangement the leads 6 are sealed into the member 4 by means of the disc 5 while in the prior arrangement they are not. The disc 5 may be made of a low-melting glass, since this disc, contacting with the member 4 supporting it, need not have any bearing capacity during the sealing operation.

FELIX HERRIGER.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

F. HERRIGER
ELECTRON TUBES
Filed Oct. 5, 1940

Serial No.
359,952



Inventor:
Felix Herriger
by [signature]
Atty

Published May 25, 1943 Serial No. 360,260

ALIEN PROPERTY CUSTODIAN

BELL-TRAYS

Hellmut Giehne, Heinrich Hohenschutz, and Heinz Krekeler, Ludwigshafen - on - Rhine, and Gerhart Schott and Georg Kutke, Jena, Germany; vested in the Alien Property Custodian

Application filed October 8, 1940

The present invention relates to improvements in the construction of bell-tray arrangements.

In the common practice of effecting a continuous interchange of substance or heat between two liquid mediums or between a liquid and a gaseous medium, columns are used which are charged with fillers, for example with such of the Raschig ring type, or are fitted with trays, especially trays provided with so-called bells or bubble caps. The columns provided with trays offer the advantage that the efficiency or the degree of the interchange (with reference to a given cross-section of the column) is less dependent on the quantities of the substances in interchange which are passed through the column in the unit of time than is true with filler columns, the efficiency of the latter having a more or less pronounced peak value at a definite throughput.

Where the corrosive properties of the substances to be operated preclude the ordinary metallic materials from being used in the construction of bell-tray columns, it has hitherto been the common practice, especially in the case of large-scale arrangements, to resort to the use of filler columns. Attempts to make bell-tray columns of non-metallic materials resistant to corrosion proved hitherto unsuccessful in practice, insofar as either the chemical or the mechanical resistance of the materials left much to be desired.

We have now found that bell-tray columns which are free of the said drawback are obtained by employing glass as construction material. Bell-tray arrangements according to our invention comprise glass bells and glass trays fitted with openings for the insertion of fixtures for the bells, and means for securing the bells and the said fixtures to the trays. In this manner bell-tray columns with all elements consisting of glass, may be made without difficulty of any dimension suitable in technical scale. The tray plates may be cast of glass in relatively large dimensions.

The present invention will be further described with reference to the accompanying drawings in which

Fig. 1 is a longitudinal section through a bell and part of the bell-tray as well as through means for screwing said bell upon said tray;

Fig. 2 is a top view of a tray;

Fig. 3 is a section along line A—B of Fig. 2.

Referring to the said figures in detail, sockets 1 preferably made of glass and suitable to fit in openings 2 of the tray are used as fixtures for the bells 3. The sockets and the bells resting upon them are interlocked and secured to the tray with the aid of a screw-fitted body 4 which is likewise made by preference of glass, advantageously by moulding and which body comprises an enlarged base portion with ribs 4' serving to keep the base portion in a distance from the tray in order to avoid a sealing of the opening 2, a stem-shaped middle portion protruding through the opening 2 and the socket 1 and a threaded top portion which keeps the bell in position by means of a female screw 5. Since this joint when working with liquids is subject to a permanent strain by the bubbling of the liquids, it is preferably secured in its position by a second female screw or by other appropriate means. The bell may also be secured instead of by a screw-joint by other appropriate means, for example one of the bayonet-joint type.

The damming ledges or weirs ordinarily used to accomplish a uniform distribution of the liquid over the whole cross-section of the column, are preferably made of flat shaped glass or of hollow glass bodies with rectangular cross-section (cf. 6 and 7 in Fig. 2) and advantageously secured to the tray by means of screws. 8 denotes the usual tubes for the intercommunication between two column bottoms.

According to the present invention bell-trays which are resistant to corrosion, may be made in technical dimensions, for example such of a diameter of 1 meter, in which dimensions they meet high demands as regards the quantities passed through in the unit of time.

HELLMUT GIEHNE.
HEINRICH HOHENSCHUTZ.
HEINZ KREKELER.
GERHART SCHOTT.
GEORG KUTKE.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

H. GIEHNE ET AL

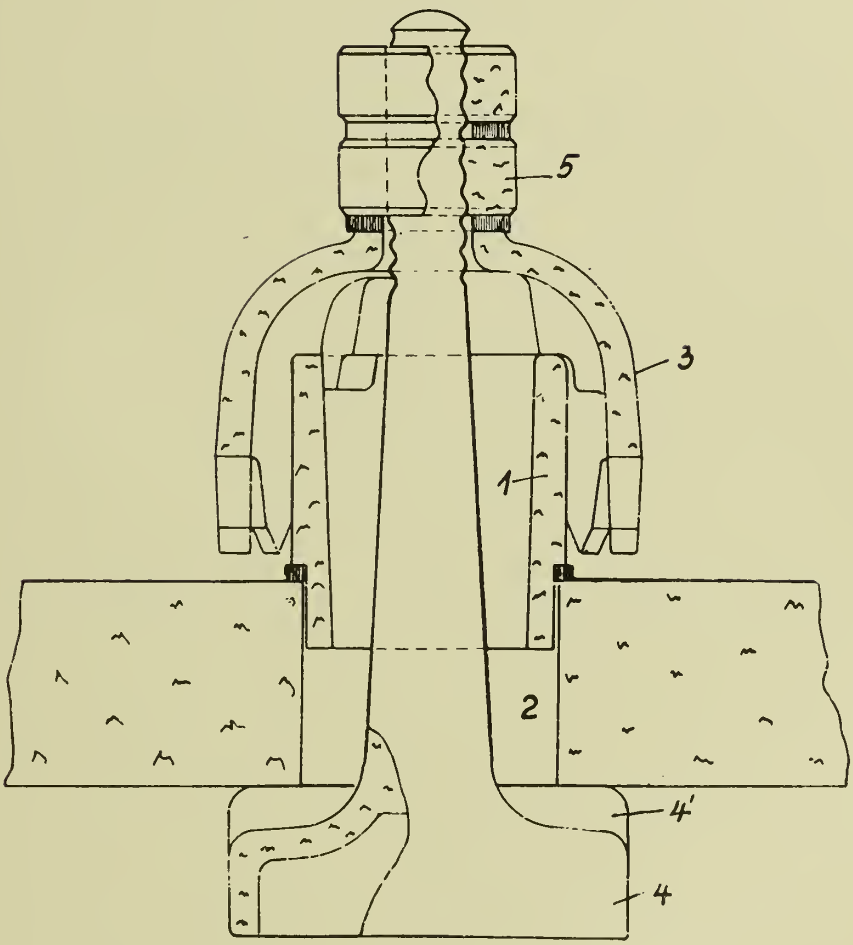
BELL-TRAYS

Filed Oct. 8, 1940

Serial No. 360,260

2 Sheets-Sheet 1

Fig. 1



Hellmut Giehne
Heinrich Hohenschutz
Heinz Krekeler
Gerhard Schott
Georg Kutke
INVENTORS

BY [signature]

THEIR ATTORNEYS

PUBLISHED	H. GIEHNE ET AL	Serial No.
MAY 25, 1943.	BELL-TRAYS	360,260
BY A. P. C.	Filed Oct. 8, 1940	2 Sheets-Sheet 2

Fig. 3

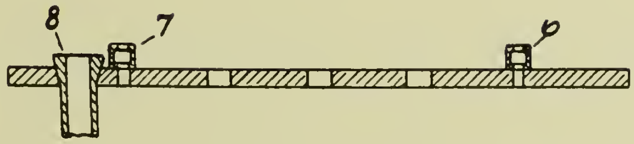
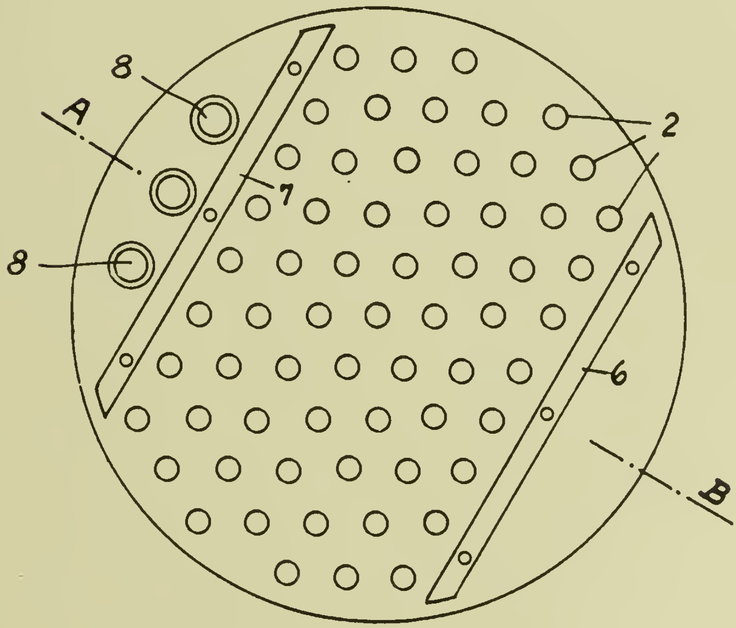


Fig. 2



Hellmut Giehne
Heinrich Hohenschutz
Heinz Krekeler
Gerhard Schott
Georg Kutke
INVENTORS

BY [signature]
THEIR ATTORNEYS

Published May 25, 1943 Serial No. 360,523

ALIEN PROPERTY CUSTODIAN

DOOR LATCHES

Anton Diemer, Stuttgart, Germany; vested in the Alien Property Custodian

Application filed October 10, 1940

This application is a division of application Serial No. 303,977, filed November 13th, 1939.

This invention relates to door latches. especially for doors of motor vehicles and for other doors which when closed are under spring tension, the bolt of such latches carrying out, in addition to its forward motion, also a transverse one or a cross motion. An object of such double motion is to secure an easy entering of the head of the latch bolt into the striker plate or behind the locking wedge, despite the door being distorted or being under spring tension when in closed position. This should occur prior to the door being completely introduced into the body frame, so that such doors need not be slammed. However, since with latches of known structure the bolt performs both these movements simultaneously, the results aimed at are not always securely attained. This is due to the fact that especially with bolts having their forward motion depending upon spring action only it may occur that the head of the bolt will not enter sufficiently deep into the striker plate opening or behind the locking wedge, being thereon jammed in the attained position on account of great friction or pressure. In such a condition the door may open accidentally upon the occurrence of the slightest concussion or distortion.

The present invention has for its object to remove this drawback, this being achieved by a suitable connection between the door handle and the latch bolt providing for both said movements being carried out consecutively only. In this way when a latch is to be unlocked, the bolt performs at first a cross motion only, whilst it is retracted into the latch casing after said cross motion is terminated. In locking operation, on the contrary, the bolt executes first its forward motion, whereafter when this latter is terminated, it carries out its cross motion providing for a complementary drawing of the door into the door frame.

With these objects in view, in a preferred embodiment of this invention, I provide a slider between the latch bolt and a lever connected to the door handle, said slider being adapted to bear on the latch bolt and on the latch casing. When the door handle performs an unlocking movement said slider first slides along a wedge surface whereafter it causes the latch bolt to perform its inward movement. The just mentioned wedge surface may be arranged either on the bolt or on the door casing or on the slider proper.

When this door latch is used with motor vehicles it is desirable that the outer door handle be able to be moved independently of the inner one, so that e. g. the inner door handle remains stationary when the latch is opened by means of the outer door handle and vice versa. In order that such a mutual independence of both door handles be obtained with the above described new door latch, I provide, according to a further improved feature of this my invention between the latch bolt and the displaced door handles or respectively between a slider acting on the latch bolt and said door handles, a swinging lever transferring the motion of the door handle either to the latch bolt or to the slider. By this means when one of the door handles is rotated, the point of engagement between the other door handle and the swinging lever serves always as stationary fulcrum for said lever.

Other features and objects of the invention will more fully appear from the following description of a number of exemplary embodiments thereof with reference to the appended drawings.

In the drawings:

Figures 1 to 5 illustrate one form of embodiment of a latch constructed according to this my invention, wherein both door handles operate independently of one another.

Figures 6 to 9 illustrate a further exemplary embodiment of a latch having mutually independent door handles, and

Figures 10 to 13 illustrate another exemplary embodiment of a structure analogous to the above mentioned ones.

In the exemplary embodiment represented on Figs. 1 to 5 both door handles 65, 66 the axles whereof are mutually displaced may be operated independently one from another. Figs. 1, 3 and 5 are views of the latch having the cover plate of its casing removed. Fig. 1 illustrates the parts of the latch in their position of rest, Fig. 3 the same parts in an unlocking position obtained by a depression of the inner door handle 66, and Fig. 5 represents the parts of the latch in their unlocked position due to a depression of the outer door handle 65. Figs. 2 and 4 are sectional views taken on lines 2—2 and 4—4 respectively of Figs. 1 and 3.

In this embodiment the bolt 30 is mounted shiftably in longitudinal direction in a chamber 35 of the latch casing and it is arranged swingably about its reinforced portion 36. The bolt 30 is held against movement in downward direction by means of its head 34 sliding in an aperture 77 of the latch casing as well as by means of a lug 79 of the cylindrical portion 36

sliding in a slit 78 of the base plate 33 of said latch casing. The leaf spring 43 presses the bolt 30, when no other greater forces are acting thereon, toward the base plate 33 of the latch casing. In this instance the roller 58 is mounted in the latch bolt and the inclined surface 71 causing the bolt to move in transverse direction is arranged on the slider 55. This latter is guided by a rectangular projection 54 engaging in the slit 78 of the base plate 33 of the latch casing in parallelism to the direction of movement of the latch bolt 30. Said slider carries on its inner bifurcated end 80 a swinging lever 82 pivotally mounted on a pin 81. A contraction spring 84 attached to the base plate of the latch casing by means of a pin 83 urges the latch bolt into its locked position. The cut-out 74 of the latch bolt wherein the slider 55 moves has its aperture directed downwards. The purpose of such arrangement is to enable the swinging lever 82 to pass through said cut-out. Therefore, the latch bolt head 34 is connected in that case with the cylindrical portion 36 of the bolt by means of an upper arm 37 only.

A tumbler 85 mounted rotatably in the latch casing is positively connected to the outer door handle 65 by means of a square shank 86 of said handle being inserted into the tumbler. Said latter carries rigidly connected thereto and arranged in the latch casing a lever 87 also pivotally connected by means of a link 90 mounted on pins 88, 89 with the bottom end of the swinging lever 82. A contraction spring 92 attached to the latch casing by means of a pin 91 causes an extension 93 of the lever 87 to bear upon a striker stud 94 secured in the latch casing. An inner door handle 66 is positively connected by means of a square shank 96 to a second tumbler 95 also rotatably mounted in the latch casing. Said inner door handle is connected by means of a link 98 and a lever 97 attached to the tumbler with a point lying between the ends of the swinging lever 82. This connection is of a similar linked nature as that of the outer door handle 65 with the bottom end of said swinging lever. The lever 97 is drawn in its position of rest towards a stationary abutment pin 101 by means of a contraction spring 100 engaging with its extension 99.

If lever 97 is now moved upwardly by depressing the inner door handle 66, it draws first the slider 55 by means of a link 98 and of a swinging lever 82 so far in backward direction that the inclined surface 71 of said slider moves through beneath the roller 58 of the latch bolt. The latch bolt is thereby swung due to the action of leaf spring 43, about its cylindrical portion 36, towards the base plate 33 of the latch casing. In this motion the pivot 89 of the link serves as fulcrum for the swinging lever 82, so that the link 90 and the lever 87 form nearly a straight line when in position of rest. On the other hand, the traction forces transferred on the system 87, 90 when the inner door handle 66 is depressed the extension 93 of lever 87 with a greater force towards the striker stud 94, so that the outer door handle 65 remains in its position of rest when the latch is acted on by the inner door handle 66. When the slider, as it has been explained above, is drawn back by lever 97 so far that its inclined surface 71 has entirely cleared the roller 58 of the latch bolt, said slider abuts by its bifurcated inner end 80 on the cylindrical portion 36 of the latch bolt and at its further movement it draws the latch bolt into the latch casing up to the unlocking position represented in Figs. 3 and 4. When the latch is unlocked by the outer door handle 65, the movements of the slider 55 and of the latch bolt 30 are carried out in the same sequence as above, with the only difference that in said latter case the swinging lever 82 is turned by means of lever 87 and link 90 in clockwise direction. Hereby also the pivotal connection 102 of the link 98 serves as relatively stationary fulcrum for the swinging lever 82 (see Fig. 5).

During the locking operation of the latch, both of the door handles 65 and 66 are also operated independently one from another so that any time when a door handle depressed prior to the door being closed performs an ascendent movement it operates a tilt of the swinging lever 82 in counterclockwise direction. Simultaneously also the pivot pin of the other door handle engaging with the swinging lever acts as a fulcrum for said latter. By this means first of all the latch bolt is shifted outwardly together with the slider by the assistance of contraction springs 84, 92 and 100 until said bolt strikes onto a pin 103 secured in the lock casing whereafter the slider 55 continues its outward movement alone until it reaches the position represented on Figs. 1 and 2. Following to this the inclined surface 71 of the slider enters between the casing base plate 33 and the roller 58 of the latch bolt swinging thereby said bolt about its cylindrical portion 36. The head 34 of the latch bolt is thereby forced against the abutment 70 of the locking wedge 52, the inner surface 62 of the door being thus pressed to the yielding sealing strip 50. The force applied for this purpose on the door handle is relatively small, because the parts 97, 98 and 87, 90 respectively act as toggle links which are nearly straight at the end of the closing movement of the latch bolt. It may be clearly seen from the drawings that this embodiment of the latch may be used for enabling the door to be closed by a mere slamming. In this case when the latch bolt gets in contact with the inclined surface 75 of the locking wedge, it is shifted inwardly and on having passed said inclined surface it snaps back outwards again under the action of spring 84, without thereby setting into movement the slider 55 and hence also the door handles 65, 66.

In the second exemplary embodiment provided with independently operated door handles as shown in Figs. 6 to 9 the latch is represented in locked position on Figs. 6 and 7. Fig. 7 represents a section of Fig. 6 taken on the line 7—7. Fig. 8 represents the latch unlocked by a depression of the inner door handle 66 whilst in Fig. 9 the same position of the latch bolt is shown after the outer door handle has been depressed. In all of the Figures 6, 8 and 9 each of which represents the latch in elevation the cover plate 42 of the latch casing has been removed.

Broadly speaking, the details and the operation of this latch are similar to those of the above mentioned exemplary embodiment. But in this case the levers 87, 97 moved by the door handles are not connected to the swinging lever 105 by links, such connection being made by means of pins 106, 107 carried by levers 87, 97 respectively and engaging into preferably arcuate slots 108, 109 of the swinging lever. Thus when lever 87 is moved downwardly or lever 97 upwardly the swinging lever 105 is always tilted in clockwise direction, a pin 106 or 107 of that of the levers 87, 97 which is not moved, serving thereby as a ful-

crum for said swinging lever. A further difference between this exemplary embodiment and the preceding one resides therein that in this case the roller **58** is arranged on the outer end of the slider **55**, whilst the cambered inclined surface **71** is formed on the head **34** of the latch bolt.

Another form of door latch according to this invention having handles acting independently from one another is represented in Figs. 10 to 13 of which Fig. 10 shows again the latch in locked position with the cover plate **42** of the latch casing having been removed; Fig. 12 is a section of Fig. 10 taken on the line **12—12**, whilst Fig. 11 represents in elevation a latch unlocked by the depression of the inner door handle **66** and Fig. 13 is a similar view of a latch having been unlocked by a depression of the outer door handle **65**.

In this exemplary embodiment the swinging lever **107** engages by means of a cut-out **111** provided on its upper end with a pin **81** of the slider **55**. On the bottom end of a surface of the swinging lever facing the base plate **33** of the latch casing a block **112** is attached provided on two of its sides with gearing teeth. The upper teeth **113** of this block engage with a segment **114** provided with corresponding teeth and mounted to rotate on a stub shaft **115** secured in the base plate **33** of the latch casing. In the same way the bottom teeth **116** of part **112** are in engagement with a toothed segment **117** rotatably mounted on a stub shaft **118** also attached to the base plate 33.

The teeth **113** and **116** of the block **112** are formed on curves facing one another with their concave sides, the center of curvature **119** of the arc of teeth **113** lying in the point of contact of the pitch circle of teeth **116** of the block **112** with the pitch circle of the teeth of segment **117**. On the contrary, the center of curvature **120** of the arc of teeth **116** of part **112** is located in the point of contact of the pitch circle of the teeth **113** of part **112** with the pitch circle of the teeth of segment **114**. Therefore, the swinging lever **110** will rotate about the center of curvature **119** as about a fixed fulcrum in clockwise direction when the toothed segment **114** is rotated in counterclockwise direction. Furthermore, there will be also a clockwise rotation of the swinging lever **110**, but this rotation is carried out about the center of curvature **120** as about a fixed fulcrum, when the toothed segment **117** is turned in counterclockwise direction. The toothed segment **114** is also in operative engagement with another segment **121** rigidly mounted on the rotary tumbler **95** of the inner door handle **66**, whilst the toothed segment **117** engages with a further segment **122** rigidly mounted on the rotary tumbler **85** of the outer door handle **65**. Owing to the above disclosed arrangement, when the inner door handle **66** is depressed the swinging lever **110** is turned about the center of curvature **119** in clockwise direction. By this motion, in the same way as has been described in connection with the precedent embodiment it retracts primarily into the latch casing the slider **55** and thereafter also the latch bolt **30**. A similar unlocking operation is also present when on account of depressing the outer door handle the swinging lever **110** is rotated about the center of curvature **120** in clockwise direction. On the other hand, when both of the door handles are moved in upward direction, the parts of the latching mechanism move in opposite directions. When both segments **121** and **122** are in their position of rest they are drawn respectively by contraction springs **123** and **124** towards abutment pins **125** and **126** fixed on the base plate of the casing. When the latch is unlocked by means of one of the door handles **65**, **66**, the segment belonging to the other door handle is more strongly pressed against its abutment pin by reaction forces acting thereon. In this way, the position of one of the door handles is not influenced by a depression of the other one, both door handles being thus adapted to operate quite independently from one another.

ANTON DIEMER.

PUBLISHED
MAY 25, 1943.
BY A. P. C

A. DIEMER

DOOR LATCHES

Serial No. 360,523

Original Filed Nov. 13, 1939

3 Sheets-Sheet 1

Fig. 1

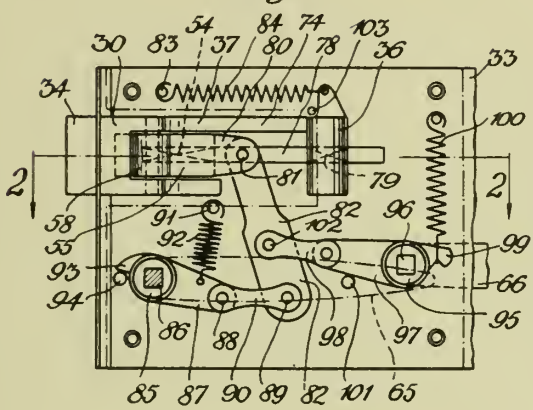
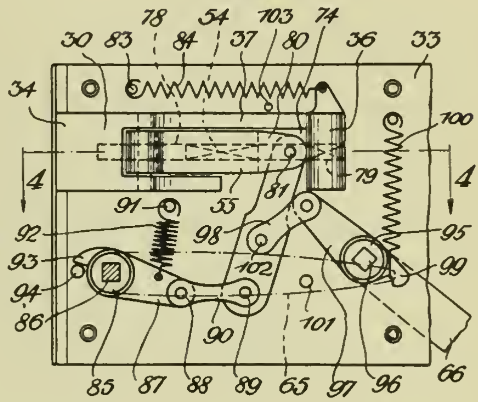


Fig. 3



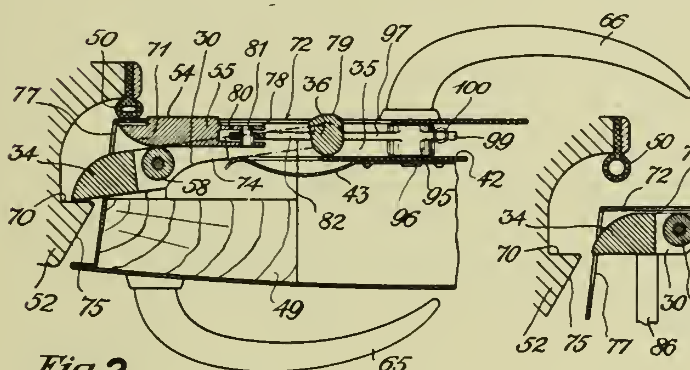


Fig. 2

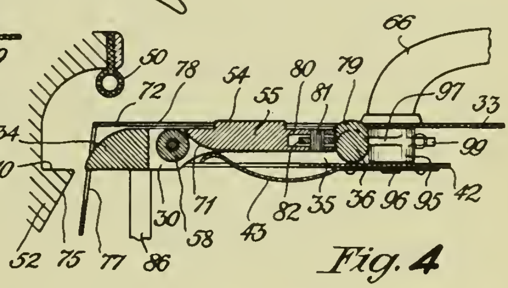


Fig. 4

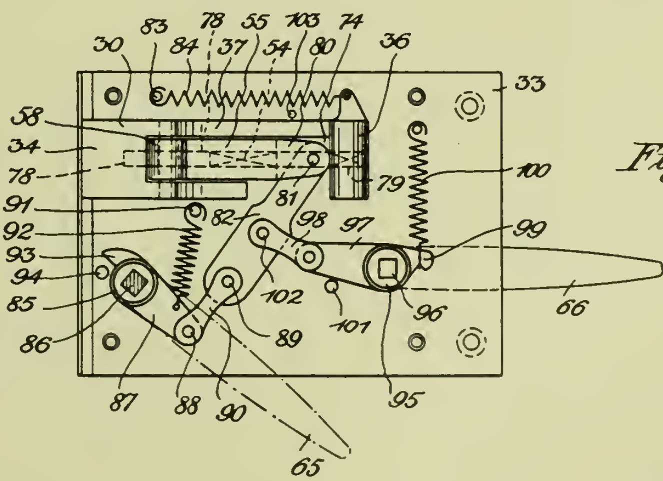


Fig. 5

INVENTOR
ANTON DIEMER
BY A. A. Wichl
Marshall ...
ATTORNEYS

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. DIEMER
DOOR LATCHES
Original Filed Nov. 13, 1939

Serial No. 360,523
3 Sheets-Sheet 2

Fig. 6

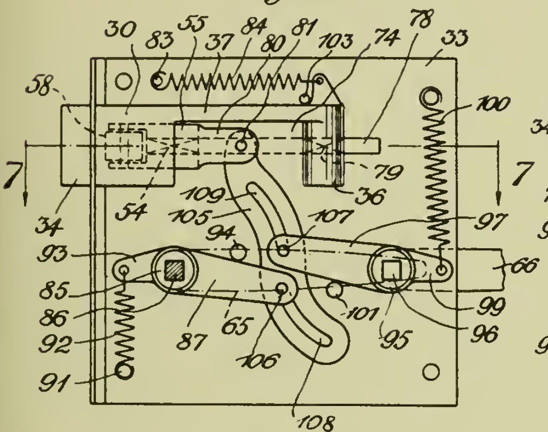
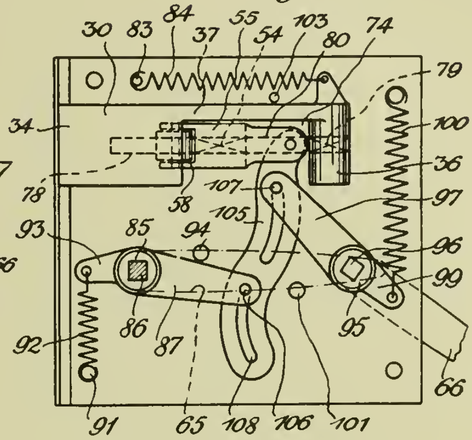


Fig. 8



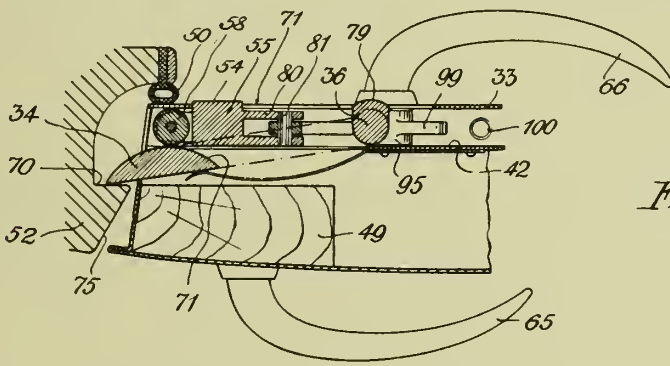


Fig. 7

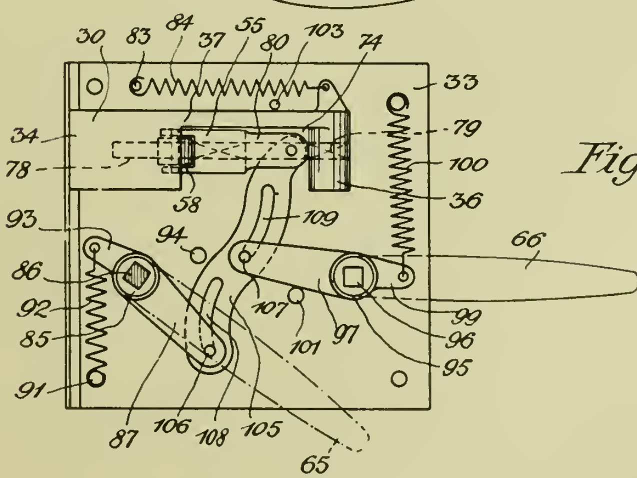


Fig. 9

INVENTOR
BY ANTON DIEMER
ATTORNEYS

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. DIEMER

DOOR LATCHES

Original Filed Nov. 13, 1939

Serial No. 360,523

3 Sheets-Sheet 3

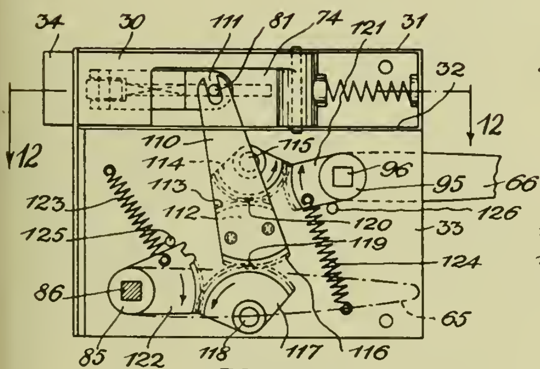


Fig. 10

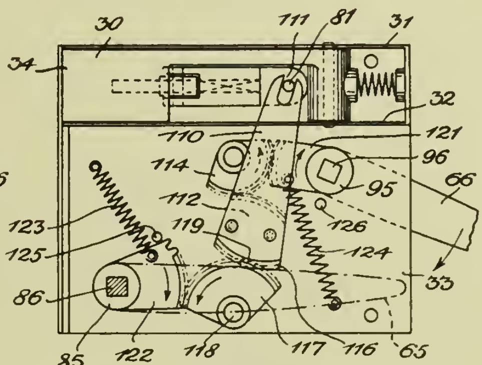


Fig. 11

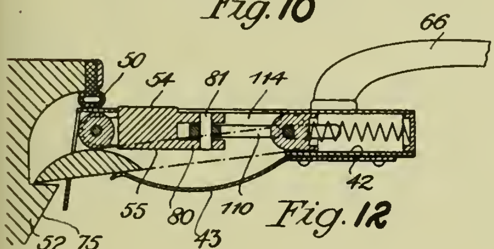


Fig. 12

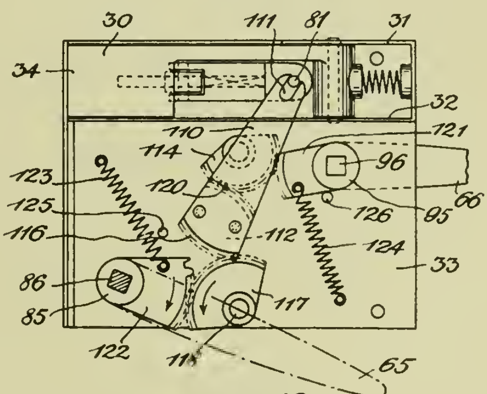


Fig. 13

INVENTOR

ANTON DIEMER

BY A. A. Diehl

Marvell R... Jr.

ATTORNEYS

Published May 25, 1943

Serial No. 360,688

ALIEN PROPERTY CUSTODIAN

VIBRATION DAMPING SUSPENSION

Hans Joachim Seidel, Berlin-Wilmersdorf, and Adolf Weiler, Berlin-Spandau, Germany; vested in the Alien Property Custodian

Application filed October 10, 1940

The invention relates to a suspension of power plants or of similar installations producing vibrations, particularly aircraft power plants by means of sleeve type springs, preferably with rubber as resilient material. The sleeve type rubber springs are embracing a carrier bolt in such a manner that a direct connection between bolt and rubber sleeve is not necessary.

Suspensions of this kind are already known per se. With these arrangements the sleeve type rubber springs are connected with the engine installation serving for mounting the power plant into the cell and provision is made on the casing of the power plant to receive the mounting bolts. This mode of suspension has the disadvantage, that it is mechanically unfavourable to connect the mounting bolts with the casing parts which are preferably made of light metal or corresponding alloys, for it appears that in such cases the points of application of the mounting bolts at the casing must be strengthened for a more favourable transmission of power in order to avoid a breakage of the bolt and/or a damage to the casing. Further, the different cell manufacturing works are designing the cells corresponding to the engine installations, each manufacturer preferring a particular embodiment of the rubber spring type suspension points. This means that many cases it is not feasible to mount the same power plant into different cells, as an exchange of the rubber spring is not always possible. This may lead to difficulties specially in war-time service since a storing of the different rubber springs becomes necessary.

These disadvantages are avoided, according to the invention, by the fact that the rubber springs form a part of the power plant. A particularly simple construction is realised by applying the sleeve type springs in a preferably circular groove provided in the engine crankcase or in an essential part of it.

This circular groove is fitted to be closed by a closing device like a cover. In this closing device apertures are provided through which the mounting bolt, being articularly or rigidly connected with the carrier bolt, is projecting. In this manner the sleeve type springs forming constituent parts of the crankcase and thus of the power plant can be designed from the first in such a way that no resonance vibrations of the power plant are occurring within the range of operating speed of rotation of engine and propeller.

Preferably the sleeve type springs are not equally spaced in the circular groove, but arranged, according to the elasticity of the engine installation resp. of the wing of the aircraft, with relation to the vertical and the transversal axis so that natural frequencies of both the said axis possibly coincide. In this manner the differences in the elasticity of the engine installation can almost be compensated in these directions of axis. This distribution of the sleeve type springs can be adapted subsequently to the actual engine installations or predetermined already from the first. Further owing to the insertion of the complete sleeve type spring into the crankcase the mechanical structure of the suspension becomes considerably more favourable, as now the forces are transmitted from the crankcase and distributed over the large surface of the sleeve so that any local overstressing of the crankcase is no longer occurring. Since at the same time the sleeve springs have become constituent parts of the engine, it is possible to exchange the same power plant among different cells.

The structural details of the sleeve type springs mounted in the approximately circular recess and fitted to be closed by a cover may be seen from the following description. The drawing shows the invention with its essential parts in two examples of construction, in which

Fig. 1 is a side view of the suspension partly in section;

Fig. 2 is a circular arrangement of a sleeve type spring in section;

Fig. 3 is a view of the circular arrangement of the sleeve type spring with the cover plate removed, partly in section.

Fig. 4 is a section on the line IV—IV of Fig. 2.

Fig. 5 is a section on the line V—V of Fig. 3.

At the crankcase **1** of the power plant (not represented) or at the bell shaped part **2** of the crankcase is provided an approximately circular groove, which is closed by an eventually sectional cover plate **4**. Into the groove **3** are placed sleeve type springs **5** which can be distributed regularly on the circumference or arranged at certain intervals. The cover plate **4** has apertures **6** out of which the mounting bolts **7** projecting from the sleeve type springs are standing. These bolts **7** are bolted at **9** to the engine installation **8** for the suspension of the power plant.

The sleeve type spring comprises in a manner known per se and as shown in Fig. 2 a sleeve **10** and a carrier bolt **11** to which a resilient material, preferably rubber, is bonded. The mounting bolt **7** is specially put on the carrier bolt **11** or is forming one piece with it. The mounting bolt **7** is projecting through a recess **13** of the sleeve **10**, as can be seen in Figs. 4 and 5.

In order to enable such sleeve type springs to be accommodated almost circularly in the groove 3 of the bell-shaped part 2 of the crank-case, the carrier bolt 11 is, as to be seen in Fig. 2, bent in conformity with the radius of this circle i. e. in this case the average radius and provided at its ends preferably with cylindrical extensions 14. The convex surface of the sleeve 10 is shaped to conform with the groove 3 and split for the introduction of the carrier bolt 11 which in the example of construction is made of one piece with the mounting bolt 7, the division plane running in the direction of the axis of the mounting bolt. In this manner it is possible to insert the mounting bolt 7 together with the carrier bolt 11 into the divided sleeve and to secure the rubber cover 12 by vulcanizing, so that all parts of the sleeve type spring form a self-contained unit. The interior bore of the sleeve 10 is preferably cylindrical at its ends, the axis of the bored sleeve 10 coinciding with the axis of the cylindrical extensions 14 of the carrier 11. These axes include an angle, the sides of which form tangents to the circle after the carrier bolt 11 being bent corresponding to the average radius of the groove 3.

The bore at the ends of the sleeve 10 and the extensions 14 serve for screwing in or for inserting special abutments in the shape of rings 15. The inner width of these rings is large enough that during normal operating conditions the carrier bolt 11 with its extensions 14 is nowhere abutting. With growing stresses, i. e. through static stresses due to the influence of external forces, e. g. propeller traction, torque or during levelling up the airplane, the extensions 14 of the carrier bolt 11 abut against the annular stops 15. In this way forces e. g. below 1,5 resp. 2,5 g are transmitted, without interfering with the rubber cover, directly to the suspension points, so that the rubber is dealt with sparingly. If such limiting stops would be lacking, there would be the danger of the rubber cover becoming destroyed or at least slackened from its assembly.

Instead of adapting the entire convex surface of the sleeve 10 to the shape of the recess 3, it is also possible, as shown by the example of construction in Fig. 3, to provide the sleeve with a rectilinear cylindrical bore and e. g. to turn down the middle part of the sleeve on its convex surface at 17, so that the sleeve is not abutting at the groove 3. Into the bore 16 of the sleeve the carrier bolt 11 together with the mounting bolt 7 is inserted and the spring elements 12 are put on to both ends of the carrier bolt 11 and fixed by screwing up the nut 18.

Between the mounting bolt 7 and the spring elements 12 an abutment 19 is still provided at each side. Both these abutments 19 can abut on the interior wall of the sleeve 10 and have the same object as the annular abutments 15 of the example of construction in Fig. 2. The arrangement of these abutments in the immediate vicinity of the mounting bolt 7 has the advantage, that the bending moments, in the case of the abutments on the carrier bolt 11 becoming effective, will remain small in amount.

The spring elements 12 are in this example of construction independent structural parts and are inserted into the inner bore 16 of the sleeve 10 after a particular distance ring 20 being provided in the bore 16. The spring elements 12 are held in the sleeve 10 preferably by annular screw members 21 screwed into the sleeve 10, and, according to the position of these two screw members 21, the spring elements can be so adjusted or displaced that the mounting bolt 7 occupies a predetermined position in the recess 6 of the cover plate 4. The subdivision of the resilient material in two independent spring elements has the advantage that the characteristics of resiliency can be kept lower with approximately the same spring volume and that further the ratio of the characteristics of resiliency in transversal direction to that in longitudinal direction becomes smaller. This is essential for the purpose of obtaining low natural frequencies.

In order to conform the rectilinear surface of the sleeve 10 to the curved outlines of the groove 3, the thickened ends of the sleeve 10 are turned to produce cylindrical extensions 22, of which the axes are inclined at an angle, the sides of which run in the direction of the tangents on the circle on which the sleeve in the groove is abutting. If the radius of curvature of the groove 3, as shown by the example of construction of Fig. 3, is small compared with the length of the sleeve 10, the part of the convex surface of the extensions 22 opposite the diminishing radius of the groove 3 would be no longer abutting in the groove. To avoid this, the ends of the sleeve 10 are turned once more circumferentially and cylindrically, according to the radius variation, preferably on the outer halves at 23, in which case the axis of the turned part may coincide with the axis of the inner bore 16 of the sleeve 10. Thus the bearing face of the extensions 22 is diminished, as shown in the right part of Fig. 3. Owing to this second turning, the extension 22 is brought with its entire convex surface into contact with the groove 3. When fastening the sleeve 10 with the help of the bolts 24, shown in section, which partly engage with in recesses 25 of the sleeve 10, the latter is absolutely secured against displacement both axially as well as radially.

If it was the question that the sleeve-type springs 10 are arranged in a groove of an approximately circular course, it is of course possible to arrange the sleeve type springs 10 also in a groove 3 which e. g. only partially has a circular course. The circular form, however, has the advantage, that the sleeve type springs can be arranged in the groove 3 at will. There is further the possibility of fastening the cover plate 4 by means of the mounting bolts 24 simultaneously securing the position of the sleeve type springs.

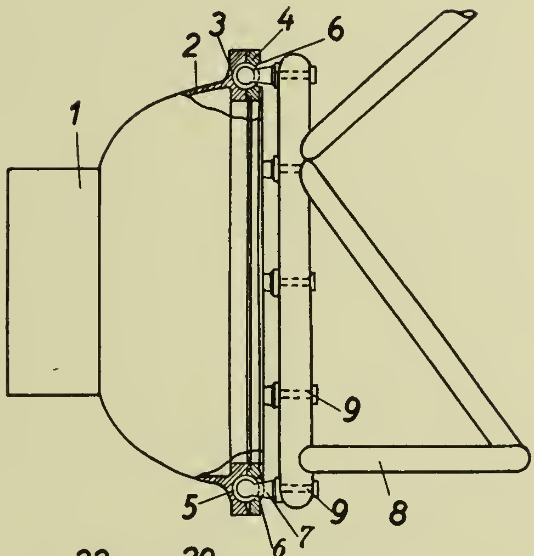
HANS JOACHIM SEIDEL.
ADOLF WEILER.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

H. J. SEIDEL ET AL
VIBRATION DAMPING SUSPENSION
Filed Oct. 10, 1940

Serial No.
360,688

Fig.1



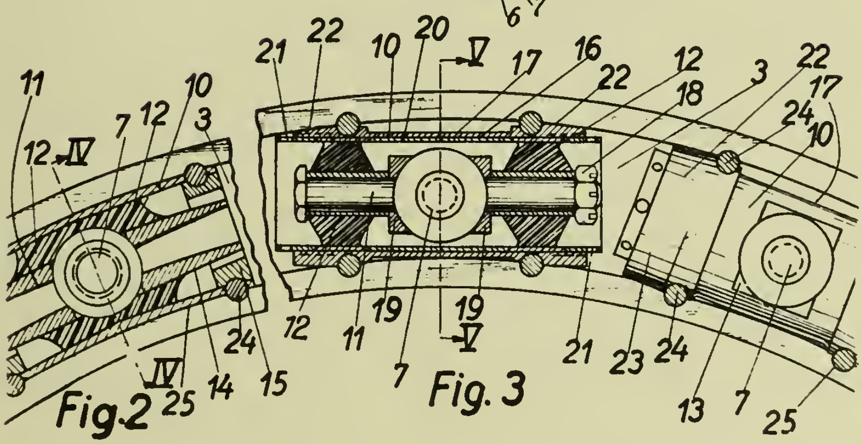


Fig.2

Fig. 3

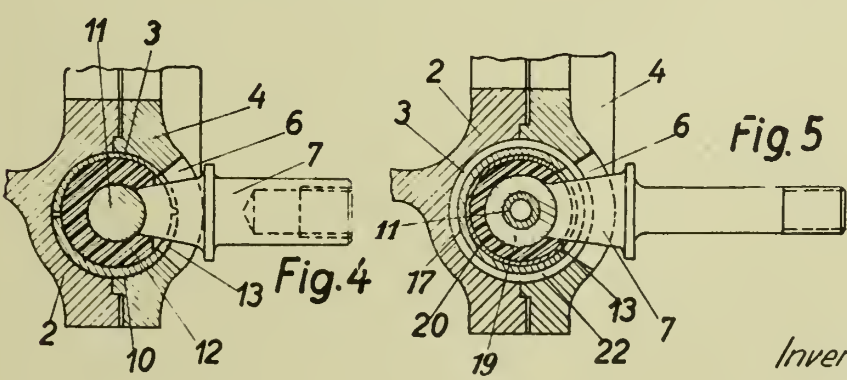


Fig.4

Fig.5

Inventors

Published May 25, 1943 Serial No. 361,006

ALIEN PROPERTY CUSTODIAN

MEANS FOR PREVENTING WABBLING OF VEHICLES PROVIDED WITH PNEUMATIC SHOCK ABSORBERS

Baltus Boulogne and Antonie Pieter Boulogne, Pengalengan near Bandoeng, Java, Netherlands East Indies; vested in the Alien Property Custodian

Application filed October 12, 1940

This invention relates to devices for preventing wabbling of vehicles provided with pneumatic shock absorbers, which support the vehicle, either instead of or in addition to steel springs.

If a wheel of a car which is supported by highly resilient shock absorbers, has gone over a raised spot (bump) in the road, the car body begins to wabble.

In order to lessen these undesired movements of the car body, the air flowing back and forth between two or more chambers of the pneumatic shock absorbing arrangement can be retarded, and besides this other means to lessen the wabbling of the car, may be used.

Such retarding is known by United States Patent 1,528,918 but the apparatus described in said patent will, especially when driving fast on uneven roads, decrease the resiliency of the shock absorbers, due to the offered resistance being dependent of the quickness of the movement of the piston in relation to the cylinder.

The object of the invention is to lessen the wabbling of pneumatic supported vehicle bodies, without or almost without decreasing the resiliency of the shock absorbers.

A further object of the invention is, in making a turn to lessen the slanting to a side of pneumatically supported vehicles.

The invention consists in an apparatus for retarding of the air which flows back and forth between two or more chambers of a pneumatic shock absorber, and causing a resistance which is independent (or about independent) of the quickness of the movements of the car body in relation to the axles.

The invention is illustrated in the drawings and hereinafter more fully described.

On the drawings, Figs. 1, 2, 3 and 4 show devices adapted for aforementioned retarding of flowing air.

Fig. 1 shows an usual shock absorber which consist in: a cylinder **1** with a piston **2**, an auxiliary chamber **3** in an upper part **4**, which latter is provided with a flange **5** adapted to be secured to the body of the car, a link **6** adapted to be connected to one of the axles of the car, and an inlet opening **7** for admitting compressed air into the chamber **8** above the piston. Usually the chambers **3** and **8** are communicating with each other by canals or other means.

According to the invention the canal **9**, which can connects the chamber **8** to the auxiliary chamber **3**, is provided with a valve **10**, which valve is closed by a spring **11**.

The opening **12**, also serving for connecting chamber **8** to chamber **3** is provided with a non return valve **13**.

When (to support the car or a part thereof) the chamber **8** is filled with compressed air, the chamber **3** will be under about the same pressure.

If the car going over a raised spot in the road begins to wabble, the air flowing out of chamber **8** into chamber **3** through opening **12** will easily open the valve **13**, but in flowing back from chamber **3** into chamber **8** through canal **9** it will meet a certain resistance. This resistance is depending of the force of the spring **11**, and will obstruct the wabbling of the car body.

Fig. 2 shows an apparatus **14**, wherein the air flowing out of the chamber **15** into the auxiliary chamber **16**, is retarded by means of valve **17** and spring **18**.

The air flowing back and forth through channel **19** is not retarded.

Fig. 3 shows an apparatus for retarding in two directions the air which flows back and forth between two chambers of a pneumatic shock absorbing arrangement. This apparatus is provided with two sliding valves **20** and **21**, the space **22** is in communication with an air cushion supporting a vehicle, and the chamber **23** is an auxiliary chamber increasing the resiliency of the shock absorber.

The annular spaces **24** and **25** are not under pressure.

As long as the pressure in the chamber **23** and the space **22** is about the same, the sliding valves **20** and **21** are in the position as drawn, and the canals **26** and **27** are covered by these valves.

When the pressure in space **22** is sufficiently increased, the sliding valve **21** will move to the left, and air will flow out of space **22** through canal **26** into chamber **23**.

When the pressure in space **22** decreases sufficiently, the sliding valve **20** will move, and allows air to flow out of chamber **23** through canal **27** into space **22**.

Fig. 4 shows an apparatus for retarding in two directions the air which flows back and forth between two chambers of a pneumatic shock absorbing arrangement. This apparatus is provided with a sliding valve **34** and springs **35** and **36**.

If the car is not riding, the sliding valve **34** is kept in its middle position (as drawn) by the action of the springs, and the canals **37** and **38** are covered by the sliding valve.

Before the air can flow through canals **39**, **38**

and **30** it has, by its pressure, to displace the sliding valve **34** in the direction towards canal **30**. For flowing back through the canals **30**, **37** and **39** the sliding valve **34** must by air pressure be displaced in the reversed direction.

The degree of retarding is dependent of the force of the springs **35** and **36**.

Equipments such like as here above described can also be used in flexible walled shock absorbers, which are provided with two or more air chambers.

Furthermore it is preferable that the valves are as lightly as possible.

This invention is also designed to act as stabilizer, eliminating the greater part of the side sway or listing of a vehicle, encountered on sharp turns or uneven roads.

It is also evident that various changes, modifications, variations and substitutions might be resorted to without departing from the spirit and scope of the invention.

BALTUS BOULOGNE.
ANTONIE PIETER BOULOGNE.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

B. BOULOGNE ET AL

MEANS FOR PREVENTING WABBLING OF VEHICLES
PROVIDED WITH PNEUMATIC SHOCK ABSORBERS

Filed Oct. 12, 1940

Serial No.
361,006

Fig. 1

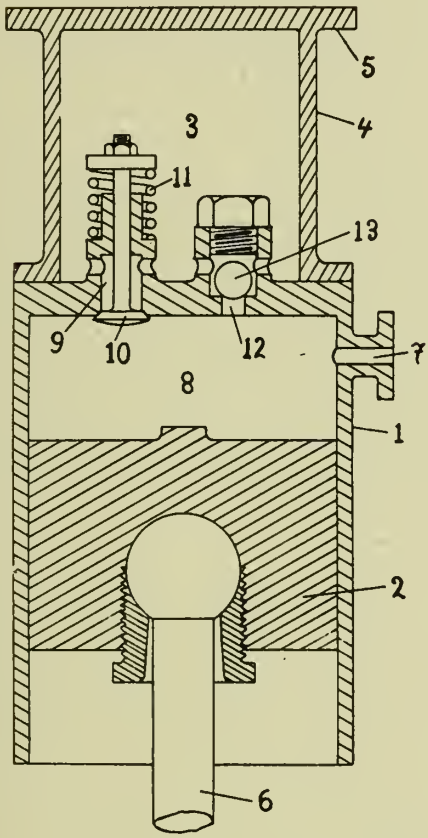


Fig. 2

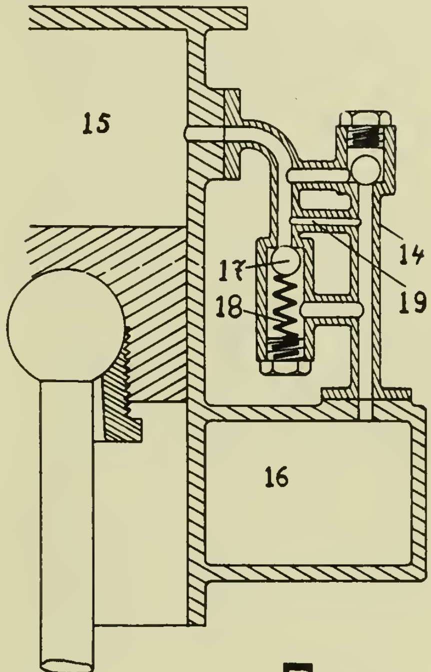


Fig. 3

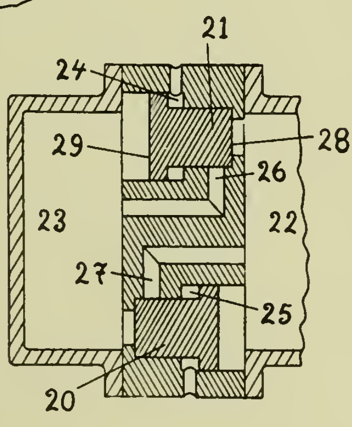
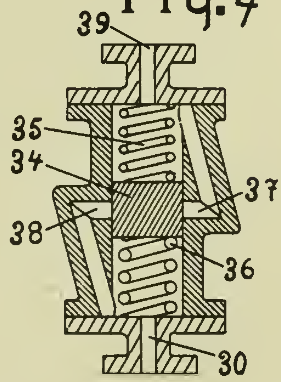


Fig. 4



Balthus Boulogne

Antonie Pieter Boulogne

Published May 25, 1943 Serial No. 361,007

ALIEN PROPERTY CUSTODIAN

PNEUMATIC SHOCK ABSORBERS

Baltus Boulogne and Antonie Pieter Boulogne, Pengalengan near Bandoeng, Java, Netherlands East Indies; vested in the Alien Property Custodian

Application filed October 12, 1940

This invention relates to pneumatic shock absorbers for automobiles and other vehicles.

Apparatus such as pneumatic shock absorbers have been announced under American Patent No. 1,544,850 and several others, but have not come into use, which shows that although there has for a long time been great interest in this subject, an equipment meeting practical requirements has not yet been found.

According to this invention, the desired degree of usefulness can be attained by the application of an air cushion arrangement of the kind as hereinafter described, examples of which are given in the accompanying drawings, Fig. 1 to 9, inclusive.

Fig. 1 is a vertical section along the line A—A.

Fig. 2 is a top view.

Fig. 3 is a vertical section on line B—B.

Fig. 4 is a vertical section on line C—C.

Fig. 5 is a horizontal section on line D—D.

Fig. 6 is a horizontal section on line E—E.

Fig. 7 is a top view of the piston.

Fig. 8 shows parts of a piston and cylinder of a somewhat different construction.

Fig. 9 shows a differently constructed piston and cylinder.

This shock absorber is so constructed that during repeated and sudden decrease of the load on the air cushion, such as takes place when making sharp turns and when repeatedly ascending and descending hills, the piston does not move too far away from the cylinder top and does not knock against the bottom of the cylinder. Furthermore, the operation of the apparatus is such that when applied to an automobile the quantity of air forming the air cushion is maintained even when passengers leave the car for a short while. The quantity of air only comes into conformity with the decreased load (without any knocking of the piston) if the car should proceed empty. Furthermore, when driving on uneven roads, the lubricating matter on the piston will not escape in its entirety with the discharge of air.

A simple form of construction can be applied. The apparatus consists of a cylinder 1 containing in it a piston 2, and operates as follows: In the cylinder chamber 3 there is maintained a cushion of compressed air and the pressure thereof is dependent upon the load which the car puts on the apparatus, hereinafter to be called the "bearer."

The quantity of air in the bearer (supply and discharge) is regulated by the position of the piston in the cylinder. The supply of air to the bearers may, for example, be from a pump or if desired from an interposed supply reservoir. If in chamber 3 there is not sufficient air pressure to bear the weight of the car, the piston will be pushed against the cylinder top by the car's weight and compressed air will then pass in the direction of the arrow through the canal 4. The valve 5 will then be opened and this air will reach the annular groove 6 in the inner wall of the cylinder and from there flow into the groove 7 of the piston. When the piston is pushed against the cylinder top the aforesaid grooves 6 and 7 communicate with each other and also with the smaller groove 8. This small groove 8, by means of the annular groove 9 in the cylinder, gives access to the small groove 10 in the piston, so that this groove 10 thus gets filled with compressed air. This air then continues its passage through a following groove 9 in the cylinder and a smaller groove in the piston, and finally reaches the small grooves 11 whence the air passes through canal 12 into the chamber 3. In this chamber the compressed air pushes the piston in the cylinder downward, and the weight of the car is borne by the air cushion being formed. The supply of compressed air to the chamber 3 stops as soon as the small grooves 11 have passed groove 6 due to the downward movement of the piston in the cylinder.

Lubricating matter—hereinafter to be called "oil"—can be supplied to chamber 3 and to the piston either with the compressed air or separately. As the piston does not remain in the same place in the cylinder during a journey, its movements will repeatedly establish communication between 11 and 6 and, consequently, it will assume a somewhat lower average position. Each time the small grooves 11 reach the groove 13, which goes over the entire circumference of the cylinder, air from chamber 3 will escape through 12, 11 and 13 into chamber 14, and any excess of oil on the piston will also be drawn along and, blown in that direction through the canal 15, serve for lubrication of the tube 16, so that leakage along this tube is prevented. The average position of the piston 2 in the cylinder 1 will then be—as shown approximately in the drawing—between the point where contact between the small groove 11 and the groove 6 is broken, and the point where contact is made between the small groove 11 and the groove 13. If during travel the piston going downward moves so far in the cylinder that the small grooves 11 pass groove 13 completely and these small grooves are thereby covered, some air will again be let

out of chamber 3 as soon as the small grooves 11, going farther downward, reach groove 17.

The arrangement can also be effected in such a manner that discharge of air from 3 can only take place when 11 communicates with 13, while discharge may also be made to take place through, for instance, more than two consecutive grooves and divided over several periods of time. The groove 17 not extending over the entire circumference of the cylinder prevents openings 18 and 19 from communicating with each other in any other way than through the groove 7 made for that purpose in the piston. In view of this break in the groove 17 two smaller grooves 11 are made in the piston, so that contact with 17 is insured by at least one of these two smaller grooves. If desired, suitable means may be employed to prevent the piston from turning during its operation. Furthermore, a number of grooves or cavities may be made in the cylinder, piston or other places, which will communicate with grooves, channels and like openings elsewhere for the purpose of admission and discharge.

The air and oil in chamber 14 are pumped out by the upward and downward movement of the piston, and in order to prevent leakage of oil along tube 16 the average pressure maintained in this chamber is somewhat lower than atmospheric pressure. By the use of valves closing by spring action, or by the application of other such means, an average pressure higher than atmospheric pressure can be obtained in chamber 14. This pressure in chamber 14 can as desired be regulated by various means. The method used here to maintain an average pressure in chamber 14 lower than atmospheric pressure is as follows: When air and oil have entered chamber 14 during the downward movement of the piston, the pressure thus caused here will escape through the opening 18 as soon as the piston in its upward movement uncovers this opening. When the piston again moves downward this opening is again covered, and the pressure in 14 increases somewhat; consequently, when the groove 7 around the piston connects opening 18 (which opening is equipped with a non-return valve) with the opening 19 some air will again escape from chamber 14 through the opening 18 and will draw along with it some oil out of 14. When the piston moves downward and the opening 18 has been covered, its further descent causes compression in chamber 14 and knocking of the piston against the bottom of this chamber is thereby prevented. Moreover, chamber 20, for example, can function either in conjunction with chamber 14 or independently, instead of it, while if desired other chambers can be made to replace or co-operate with one or both of the aforesaid chambers by adopting a different form of construction.

As shown in the example, Fig. 8, the openings 18 and 19a can be so located that they cannot be connected to each other by the groove 7, which groove can then be differently shaped and be, for instance, larger. The pumping from chamber 14 then takes place as follows: When after an upward movement of the piston (whereby the opening 18 is uncovered and discharge has taken place from 14) the opening 18 is again covered by the downward movement of the piston, pressure will be created in 14 by the piston going farther downward. Thus as soon as 7 comes into contact with opening 19 this groove 7 will be filled with air and oil flowing in there from 14, and when in the following upward movement of the piston groove 7 communicates with opening 18, the contents of this groove being under some pressure a part of it will flow into the opening 18.

For the acquirement of a pumping action such as described above, a number of grooves or excavations either over the entire circumference or parts thereof in the piston, the cylinder, the tube 16 or in one or more other places may be made, while if desired one or more canals with or without valves or other such devices may be used in different ways.

A greater part of the weight of a car will be borne by the rear axle when driving uphill than on a horizontal road, and the air cushions in the rear bearers will then consequently be more depressed. The air supply then automatically comes into operation and more air enters into chambers 3 of these bearers. The front bearers, however, will have less weight to carry when driving uphill, and if the load be considerably decreased a part of the compressed air will be allowed to escape from these bearers into chambers 14. When the pistons have come sufficiently downward below their middle position in the cylinder, the opening 18 will be covered, so that the air allowed into chamber 14 cannot escape but will press against the lower end of the pistons, thereby preventing their knocking against the bottom of the cylinders. When driving down a hill the air in the chambers 14 of the rear bearers will act in the same way. In a similar manner the apparatus helps to keep the car in a horizontal position when making a turn. During a somewhat long climb or descent the air cushions in the bearers automatically adjust themselves to their load in the same way as takes place on a horizontal road. If from a fully loaded car equipped with shock-absorbers, as above described, all passengers get out at the same time, whereby the quantity of air in the bearers is no longer in conformity with the weight of the empty car, the pistons 2 will assume such a low position in the cylinders 1 that air flows from chambers 3 into the chambers 14 until this air in these chambers 14, pressing against the lower end of the pistons, has again brought the latter so high up in the cylinders that the small grooves 11 are no longer in communication with the groove 13. Especially in the case of Fig. 8, there can be no discharge from 14 through 18 unless the pistons move up and down; therefore, if the car is not riding no air will escape from the bearers. If now the passengers get into the car again, the air present in the bearers is still in conformity with the weight of the loaded car. Should the car drive off empty, the movement of the pistons will cause a repeated discharge of air from chamber 14 through 18, and the air-filling in the bearers will in a short time be in conformity with the weight of the empty car. Should a number of passengers now get into the car, the air-filling in the bearers will not be sufficient to carry the loaded car, but replenishment will take place very quickly, because as long as the air-filling in the bearings is insufficient the pistons in the cylinders find themselves in such a position that the supply of air—which for the purpose of quick replenishment may be effected from a reservoir—takes place without interruption.

The compressed air in chamber 3 of the cylinder 1 will, if a wheel of the car goes over a raised spot (bump) in the road, be further compressed and partly driven out through the open-

ing 21. When the piston in its movement further upward covers the opening 21, only the air shut up in the upper part of the cylinder will be further compressed, the pressure of which then quickly increases and prevents the piston from knocking against the top of the cylinder. The opening 21 is in communication with an air chamber whose size determines the degree of resiliency of the apparatus. The height of the small pipe 22 determines the thickness of the oil layer on the piston. The grooves 9 in the cylinder are of great importance to the sealing off and lubrication of the piston when it is in its middle position. In order to decrease the possibility of leakage of oil along the tube 16, one or more grooves 23, with or without oil outlet holes, can be made in the inner wall of the piston 2 which slides over this tube 16. The air discharge from chamber 3 can, if desired, be so led that a part of this discharged air enters chamber 14, while another part of it follows another path. The arrangement can also be such that instead of, or in addition to, discharge of air from 3, compressed air coming from elsewhere can press against the under side of the piston. Also the discharge from chamber 14 can be made to take place in another manner, either with or without the use of other pumping equipment which may, as desired, be made to serve one or more of the bearers. The mean pressure in chamber 14 can be either higher or lower than atmospheric pressure, and such pressure can as required be regulated to meet the circumstances. Furthermore, if desired, valves (such as 5) may be omitted and similar or other such devices may, as required, be included in the same or other places.

Fig. 9 gives another example of a differently constructed cylinder and piston suitable for the purpose above described.

Grooves such as 8, 10 and others may, if desired, be of another form, as, for instance, that of a helix. These, as well as grooves 9 and others (whether or not going entirely around the circumference, or otherwise), as also canals, valves, etc., can be placed in many different ways and in larger or smaller number. Annular or other grooves or excavations can be made in the inner or outer side of the piston, in the cylinder casing, the tube 16, or other suitable places.

The supply and/or discharge of compressed air and oil to and from the chambers 3 and/or 14 can be effected by one or more other arrangements, as, for instance, sliding valves, valves or similar means, and several combinations are possible.

Compressed air can be obtained from, for instance, a motor-driven pump, wherewith under influence of the difference between the pressure in the delivery piping and that in the suction piping of said pump, the inlet to the suction piping is automatically shut off by a sliding valve, or other such device, as soon as the desired pressure has been reached.

A spring device can, if desired, be placed between the upper cover of the cylinder and the top of piston 2, or in some other place and manner, so that in case the bearer should contain insufficient air the car can ride on supported by such spring device.

It is also evident that various changes, modifications, variations and substitutions might be resorted to without departing from the spirit and scope of the invention.

BALTUS BOULOGNE.
ANTONIE PIETER BOULOGNE.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

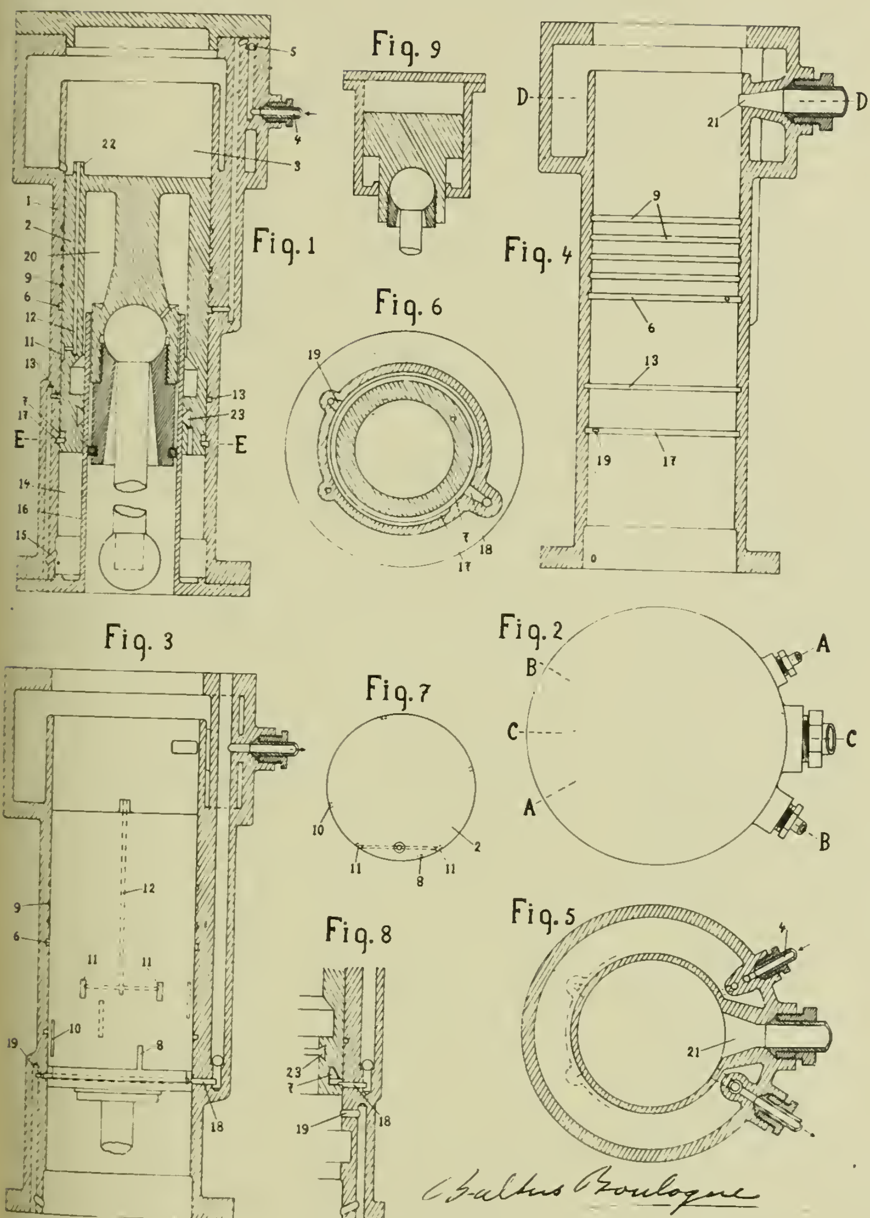
B. BOULOGNE ET AL

PNEUMATIC SHOCK ABSORBERS

Filed Oct. 12, 1940

Serial No.

361,007



Baltus Boulogne

Antonie Pieter Boulogne

Published May 25, 1943 Serial No. 361,008

ALIEN PROPERTY CUSTODIAN

MEANS FOR REDUCING THE SLANTING TO A SIDE OF PNEUMATICALLY SUPPORTED VEHICLES

Baltus Boulogne and Antonie Pieter Boulogne, Pengalengan near Bandoeng, Java, Netherlands East Indies; vested in the Alien Property Custodian

Application filed October 12, 1940

This invention relates to an apparatus for reducing the slanting to a side of pneumatically supported vehicles.

When an automobile or other vehicle is supported by highly resilient pneumatic shock absorbers, either instead of or in addition to steel springs, it will as a consequence of the strong centrifugal force when driving fast in a curve, slant to a side. Thereby the pressure in the air cushion or cushions, which support that side of the car on the outer side of the curve, will be automatically increased, while for the same reason the pressure decreases in the air cushion or cushions supporting the other side of the car.

According to the invention, an improvement can be effected here if, when taking a quick turn to the left, the air pressure is in some other way increased in one or more air cushions supporting the right side of the car (or part thereof), and at the same time the pressure in one or more cushions which support the left side of the car (or part thereof) is decreased thus preventing slant to a side of the vehicle. When taking a turn to the right said pressure alteration must be reversed. Besides this alteration of pressure, one or more stabilizer bars and or other devices may be used.

Figs. 1 to 31, inclusive, give various examples of an arrangement.

Fig. 1 shows diagrammatically a suitable arrangement for alteration of the pressure in flexible walled air-filled containers **1** supporting a car **2**, such like containers hereinafter to be called "bearers".

When in making a turn centrifugal force acts upon the body **2** of the car, and, consequently, also upon a weight **3** hanging on to it—said weight **3** hereinafter to be called the "slinger"—a piston **4** is moved by this slinger, thus reducing the volume of one of the cylinder chambers **5** and augmenting the volume of the other chamber **5**. The part of the cylinder reduced in volume is hereinafter to be called "compression chamber", while the part of the cylinder augmented in volume is hereinafter to be called "suction chamber".

When the piston moves air flows out of the compression chamber into the bearer supporting the car on the outer side of the curve, while some air out of the bearer that supports the car on the inner side of the curve, flows into the suction chamber. When the car comes out of the curve, the slinger **3** and piston **4** again assume their normal positions and the original pressure in the bearers is regained.

Even if the slinger is placed in the front part of the car (to get it to operate quicker), the slinger will not come into action before the body of the car is somewhat under the influence of centrifugal force.

The movement of the piston **4** by a slinger demands so much power that a very large and heavy slinger is needed. It is therefore preferable that said piston is not moved directly by the slinger, but by some arrangement electrically, hydraulically, pneumatically or otherwise operated and activated by a slinger or other means.

If a piston **4** and cylinder, constructed as shown in Fig. 1, be used: while when making a turn sufficient increase in pressure is obtained in the outer bearer (i. e. the bearer on the outer side of the curve), a sufficient decrease in pressure will not yet have been reached in the inner bearer, and consequently the car will still slant over to the outer side of the curve. In order that a sufficient decrease can take place in the inner bearer, the volume of the stroke of the piston decreasing the pressure in the inner bearer can be in a certain proportion to the volume of the stroke increasing the pressure in the outer bearer.

The same result is obtainable if in decreasing the pressure in the inner bearer a part of the air communicating therewith can be shut off in a separate space in such a way that this part of the air cannot expand along with the expanding air of said bearer.

It is also possible when increasing the pressure in the outer bearer to shut off a part of the air communicating therewith in such a way that the pressure of this part of air is not increased.

In order to minimize the size of the equipment, a slight slanting of the car when making a sharp turn at great speed is permissible. Such slanting, however, will only occur in very exceptional cases.

The regulation of the pressure-changes by means of the slinger can be further controlled by a mechanism activated by a possible slanting of the car body in relation to the axles, so that even if the centrifugal force acting thereon keeps the slinger to a side, no further alteration of the pressure in the bearers will take place after the body of the car has regained the desired position with respect to the axles. For this purpose the equipment can be so constructed that the pressure alteration only takes place when and as long as both aforementioned factors—the centrifugal force acting upon the slinger and a slanting of the car body—are present and co-operate for that purpose.

Fig. 2 shows a cylinder wherein two pistons, **8** and **9**, are inserted, serving for alteration of

the pressure in a bearer connected to tube 10. This bearer, by means of the openings 11 and 12, is in communication with the inner of the cylinder, and further, by means of an opening 13, an annular groove 14 in the piston 8 and an opening 15 in communication with an auxiliary chamber 16. Due to the pressure in the cylinder said piston 8 is pressed against the link 17. When piston 8 is pressed farther into the cylinder by the link 17, only the air in chamber 18, or a part thereof, will be pressed into the bearer through the opening 12 and tube 10, while the air in chamber 16 is not compressed due to opening 15 being then covered by the piston 8. When the link 17, moving in a reversed direction, allows the piston 8 also to move in that direction, piston 9 will follow this movement and thereby cover opening 12, so that no alteration of pressure takes place in the chambers 18 and 16. The air flowing from the bearer through opening 11 will fill up the enlarging space between piston 9 and the cylinder bottom, so that the pressure in the bearer will decrease.

The extent of the movement of link 17 (length of stroke) to obtain a decrease of pressure can, if desired, be greater or lesser than the movement which this link makes when increasing the pressure, this being put at a fixed relation (either permanently or otherwise) to each other. This can be accomplished by, for instance, a shaft with excentrics, cams, arms of unequal length or other mechanism.

For lubrication and sealing of the pistons oil can be supplied under pressure to an annular groove in the piston, and this can be so arranged that when, for instance, piston 9 moves the channels 19 and 20 are covered.

The volume of the aforementioned air chambers 16 and 18 can be fixed according to any desired degree of suspension resiliency.

Fig. 3 shows an arrangement for regulating of the pressure in four bearers. The apparatus comprises two cylinder casings 400 and 440 with pistons which can be moved by means of compressed air supplied from a reservoir or pump (not shown). The sliding valve 25 regulates the admission and discharge of compressed air serving for displacement of the pistons. When under influence of centrifugal force the slinger 3 is moved to a side, the sliding valve 25 is moved by the lever 26. The arm 27 turnable connected to the body of the car is by means of the rods 28 and 29 connected to a axle 30 of the car, so that when the body of the car slants to a side in relation to the axle 30, the arm 27 changes its position in relation to the body of the car. Consequently when the body of the car slants to a side the arm 27 will by means of the spring device 31 and the lever 26 displace the sliding valve 25.

When in making a turn the pistons in one of the cylinder casings (400 or 440) are moved to alter the pressure in the four bearers, a sliding valve 77 cuts off communication between these bearers and the other cylinder casing.

Figs. 4 to 13 inclusive are drawings of this apparatus, and is:

Fig. 4 is a bottom view.
Fig. 5 a section on the line B—B.
Fig. 6 a part of a section on C—C.
Fig. 7 a section on the line D—D.
Fig. 8 a view of part of the apparatus.
Fig. 9 a section of this part.
Fig. 10 an end view of this part.
Fig. 11 a section of this part on the line E—E.
Fig. 12 a diagrammatical section of the sliding valve 77 on an enlarged scale.
Fig. 13 a diagrammatical section of the sliding valve 25 on an enlarged scale.

The dimensions of the piston surfaces and of the compression and suction chambers have here been so fixed in relation to each other that an increase of the pressure in the outer bearers can take place in the proper proportion to the decrease of the pressure in the inner bearers.

Material for lubrication and sealing of the pistons, can be tapped off from the lower part of a compressed air reservoir and led into an annular groove 56 through a channel 55, whence a channel 57 leads it on to other annular grooves. When said pistons move the channels 55 and 57 are covered, so that an excess of lubricating material cannot flow into the cylinders.

The chambers 74′, 74″, 75′, and 75″, are suction chambers.

The chambers 72′, 72″, 73′ and 73″ are compression chambers.

The pistons 69 and 70 are hollow, and the spaces therein communicate with the compression chambers 72′ and 73′, respectively, through the orifices 71 when these pistons are in their resting position, as drawn. As soon as the pistons are moved said orifices are covered by the cylinder wall, so that the air in the hollow pistons is not compressed and only the air in the compression chambers, or a part thereof, is pressed into the bearers.

Compression chamber 73′ of cylinder casing 400, communicates with the suction chamber 75″ of cylinder casing 440 via canal 82′, sliding valve 77 and canal 83″.

The bearer 35 supporting the right side of the car, being connected to the flange 81 of the sliding valve housing, is thus in communication with the compression chamber 73′ of 400 and with the air in the hollow piston 70, as well as with the air in the suction chamber 75″ of 440. Another bearer, also supporting the right side of the car, is connected to flange 80 of the sliding valve housing, and communicates with the other compression chamber 72′ in 400 through canal 78′ and with the other suction chamber 74″ in 440 through canal 79″. The bearers supporting the left side of the car are connected to the flanges 84 and 85.

Fig. 12 being on an enlarged scale makes clear the above description.

As long as no alteration of the pressure in the bearers is desired, air pressure must be maintained in the chambers 76 to keep the pistons in their resting position while the chambers 86 are under atmospheric pressure.

When making a turn to the right, the air pressure extending in chamber 76 of cylinder casing 440 must be discharged and compressed air must be led into chamber 86 of the same cylinder casing. This air flowing through opening 93 and canal 94 enters into space 40 and will by moving of the sliding valve 77 shut off the canals 78′, 79′, 82′ and 83′, so that the communications with cylinder casing 400 are cut off.

The air admitted into chamber 86 of cylinder casing 440 will displace the pistons inserted in this cylinder casing and causes enlarging of the suction chamber 75″. A part of the air present in the right bearer 35 then flows through pipe 36 out of the bearer 35 into said suction chamber 75″ so that the pressure in the right bearer 35 is decreased.

At the same time the pressure in the other right bearer too must be decreased and for that purpose this bearer is connected to flange 80 and communicates with suction chamber 74'' through canal 79''.

Each of the bearers supporting the left side of the car is connected to one of the flanges 84 and 85.

In making a turn to the left, the pistons in the cylinder casing 400 move, and communication is cut off between the bearers and the cylinder casing 440.

When driving straight ahead the sliding valve 77 is in its middle position, so that each of the four bearers is in communication with a compression chamber of one cylinder casing, and with a suction chamber of the other cylinder casing, thus the air cushion of each bearer is in communication with the air in one compression chamber and the air in one hollow piston of one cylinder casing, and also with the air in one suction chamber of the other cylinder casing.

When the pistons in the cylinder casing 400 move, a pressure decrease takes place in the two separate suction chambers 74' and 75' of this cylinder casing, while in the two separate compression chambers 72' and 73' of this cylinder casing a pressure increase takes place. The compression chambers then remain in communication with the bearers on the outer side of the curve, while the suction chambers remain in communication with the inner bearers.

Instead of in sliding valves (such as 77) grooves, excavations or the like may be made in the pistons for cutting off and reestablish communications by displacements of these pistons.

The pistons are kept in their resting position by pressure in chamber 76. When chamber 76 is put in communication with chamber 86, so that a part of the air from the former (76) flows over into the latter (86), the pistons move a part of their way. For the purpose of bringing the pistons to the end of their stroke, it is however necessary that the air from 76 be discharged and new compressed air be supplied to chamber 86.

To bring the pistons back to their resting position, the sliding valve 25 by again bringing 86 into communication with 76, in a similar way allows a part of the compressed air to flow out of 86 into 76 and thus cooperate to move the piston. This method reduces the comsumption of compressed air. To make possible this flow over of air there are built into the sliding valve 25 two bodies 88, each of which is partly a sliding valve and partly an ordinary valve.

In Fig. 13 one of these bodies 88 is shown in view with the ordinary valve closed, and the other in section with the ordinary valve open.

If in making a turn the centrifugal force makes this desirable, the sliding valve 25 is so moved that those pistons are displaced which are able to increase the pressure in the bearers supporting the car on the outer side of the curve.

The canals 95 serve for admission and discharge of compressed air to and from the chambers 76, while the canal 96 serves for the supply of compressed air from, for instance, a reservoir. This arrangement operates as follows: When the sliding valve 25 is in the middle position chambers 76 are under pressure and the pistons are thereby kept in their resting position. In order to avoid unnecessary consumption of compressed air and to allow only sufficient air to pass into chamber 76 (to keep the pistons in their resting position) air is tapped off from canal 96 by means of a pressure reduction valve 92 and led into a canal 97. The pressure in said canal 97 is thus lower than that in 96 and this canal 97 is in communication with the canals 98 in the sliding valve 25 when the pistons are in the resting position (middle position of 25). Each canal 98 always remains in communication with a wide groove 99 in 88, which groove, when the ordinary valve of 88 rests against its seat, communicates with a groove 100 in the sliding valve 25. Groove 100 is in communication with a canal 101 in the sliding valve 25. When the sliding valve 25 is in its middle position canal 101 is in communication with chamber 76 through a groove 102 and the canals 103 and 95, so that the air in both chambers 76 is of the pressure as reduced by 92. This same pressure is then also present in the canals 104 and 105, and the two bodies 88 in the sliding valve 25 are then in such a position, due to action of their springs, that their ordinary valves are closed.

When now in making a turn the sliding valve 25 is sufficiently displaced, one of the canals 103 is covered by it, so that the pressure in the chamber 76 which communicates with that canal remains unchanged. While at the other end of the sliding valve 25 the groove 113 comes into communication with the canal 91, so that the air pressure extending in space 60 will escape out of this space into chamber 86. At the same time the canal 105 has become communication with the space 116 bordering on the valve of 88 the pressure of air coming from 105 into 116 opens this valve and the compressed air will flow out of chamber 76 through 95, 104, 105, 116, 101, 113 and 91 into chamber 86. During this overflow the canal 107 is covered by the body 88 so that during that time no air is discharged out of chamber 76 through 95, 103, 106, 107 and 109. Also the groove 100 being covered by the body 88 during this overflow no air supply can take place from canal 96 through 112, 98, 99 and 100 into chamber 86, but as soon as the pressure in chambers 76 and 86 has become about equal the ordinary valve of 88 will be closed by its spring, and air supply can take place from 96 through 112, 98, 99, 100, 101, 113 and 91 into chamber 86, at the same time discharge of air can take place out of chamber 76 through 95, 103, 106, 107, 108, 109, 110, 111 and 90. Thus pressure is built up in chamber 86 and the air is flowing out of chamber 76 so that the pistons move and the pressure in the bearers is altering.

As soon as sufficient alteration of pressure is obtained in the bearers and the sliding valve 25 is moved back somewhat, no further entry or exit of air in the chambers 76 and 86 takes place, and the pressure reached in the bearers is thus retained until the position of the sliding valve is altered.

When the groove 113 is in contact with the canal 91 the pressure extending in 91 is also present in the canals 114 and 115, the latter being then shut off by the sliding valve 25. When the sliding valve 25 returns to its middle position due to the car coming out of the curve, canal 115, which connects with chamber 85, is brought into contact with the space 116 bordering on the valve of 88, so that the air pressing in this space opens this valve. The space 116 being brought somewhat earlier into communication with canal 115, and 102 with 103, than groove 106 comes into contact with canal 91, the latter connection takes place when valve 88 has already been moved (in 25), and covers canal 107 and groove 100.

The ordinary valve of body 88 opened by the pressure in space 116 allows compressed air to pass from chamber 86 through 91, 114, 115 and 116 into canal 101 and thence through the groove 102, through 103 and 95 into chamber 76.

Inasmuch as 88 when its valve is opened covers the groove 100 (thus pressure cannot flow from 98 into 101 and space 80), this valve will be closed by its spring only when the pressure in the chambers 86 and 76 is approximately the same. By the closing of this valve the groove 100 comes into communication with the wide groove 99 and new compressed air flowing through 96, 97, 98, 99, 100, 101, 102, 103 and 95 enters 76, the while reduction valve 92 limits the pressure.

At the same time by closing of the valve of body 88 the groove 106 connects the canal 107 to the canal 109 so that discharge from chamber 86 takes place through 91, 107, 108, 109, 110, 111 and 90.

When under the influence of centrifugal force the slinger 3 is moved to a side, the sliding valve 25 is moved by the lever 26, but since the movement of the slinger is limited to fixed points, the displacement of valve 25 is still insufficient to cause a pressure alteration, but as soon as arm 27 changes position due to a commencement of slanting of the car body with respect to the axle, the sliding valve 25 consequently moves a little further and alteration of pressure will take place causing the car to regain its correct position with respect to the axle. The arm 27 then returns to its original position and the sliding valve again moves back to the position where no or no further pressure alteration in the bearers takes place and the car body remains in the desired position. Thereafter, as soon as the car comes out of the curve, the slinger returns to its original position, the sliding valve goes back to its middle position and the original pressure in the bearers will be regained. The arm 27 is connected to the lever 26 by an interposed spring device and the movement of this is also limited to fixed points.

In order to make easy the displacements of the sliding valve 25 and body 88, a plurial of canals 98 and 107 are made in the circumference of the sliding valve 25.

Figs. 14 to 31, inclusive, show another arrangement for altering the pressure in four bearers.

Fig. 14 is a side view.

Fig. 15 a top view.

Fig. 16 a section along the line F—G—H—K of Fig. 19.

Fig. 17 a section along the line L—M—N of Fig. 18.

Fig. 18 an end view.

Fig. 19 an identical end view but wherein the cylinder cover is omitted.

Fig. 20 a section along the line O—O.

Fig. 21 a section on P—P.

Fig. 22 a section on R—R.

Fig. 23 a section on S—S.

Fig. 24 a section on T—T.

Fig. 25 a section on U—U.

Fig. 26 a section on V—V.

Fig. 27 a section on W—W.

Fig. 28 a section on X—X.

Fig. 29 a section on Z—Z.

Fig. 30 a section of a sliding valve on a larger scale, and

Fig. 31 is a diagrammatical representation of the various sliding valves.

In this arrangement only one cylinder casing is utilized in which the pistons are moved. When centrifugal force acting upon the slinger from left to right displaces the sliding valve 117 (to move the pistons), each of the sliding valves 118 and 119 will be moved in a certain direction, and when the sliding valve 117 is displaced in a reversed direction, the movement of the sliding valves 118 and 119 is also reversed.

In making a turn, whether to the right or to the left, the bearers will, by means of the sliding valves 118 and 119, be so connected that the outer bearers are in communication with the compression chambers, while the inner bearers communicate with the suction chambers.

In order to prevent a part of the air from the bearers from remaining in the cylinder casing when the connections to the bearers are changed, the compression and suction chambers in the cylinder casing are filled with oil. If a pressure increase is desired in one of the bearers, oil coming out of a compression chamber is led into a compartment communicating with the air cushion of such bearer, whereby the pressure in the bearer increases. When driving in curves the oil fillings in the cylinder casing prevent air from being brought over from one bearer to another. The space between the tubular housing wherein the cylinder casing is located and this cylinder casing is divided into four compartments by the walls 120, 121 and 122, while a wall 123 across these compartments divides each of them in two, thus forming eight air compartments. When driving straight ahead, two such compartments, one lying above the other, are in communication with each bearer, so that the compressed air in these compartments increases the resiliency of the air cushions supporting the car. The quantity of oil used is such that when the pistons are in their resting position (as shown in Fig. 17) not alone is the cylinder casing quite full, but each of the four upper compartments is also filled to such an extent that the sliding valves 118 and 119 and the canals 124 adjoining them remain below the level of the oil (as shown in Fig. 22). Each of the four bearers is connected to a canal 126 and a canal 127 by means of a flange 125 which has an excavation in it for the purpose of communication.

By means of canals 126 each of the bearers is in communication with one of the grooves 128 in the housings of the sliding valves 118 and 119, while, furthermore, the bearers individually are connected by means of a canal 127 with one of the excavations 129. Opposite these excavations in the housings of the sliding valves similar excavations 130 are located, each of which is connected to a pipe 131. When the pistons are in their resting position the canal 132 is in communication with the canal 124 by means of the canal 133, this canal 133 being at that moment connected by the excavation 134 and the wide groove 135 with the oppositely located excavation 136. Consequently, 132, 133, 134, 135, 136 and 124 connect an upper compartment with one below. Furthermore, inasmuch as (with the piston in the resting position) the wide groove 135 connects the excavations 129, 130, 134 and 136 to each other, the canal 132 and the canal 135 are connected with the pipe 131 and the canal 127. Consequently, along that path too an upper and a lower compartment communicate with each other, and by means of a flange 125 on canal 127 are connected to one of the bearers. The air flowing back and

forth through these canals will bring any oil which may have accumulated in the lower compartment back to the upper compartment. Thus there will be practically no oil in the lower compartments, and with the pistons in the resting position each of these connect with the compartment above it. Each of these compartments is then connected by means of a pipe **131**, an excavation **130**, a wide groove **135**, an excavation **129**, a canal **127** and a flange **125** to one of the bearers. When the pistons are in their resting position, as shown in Fig. 17, the sliding valves **118** and **119** being in their middle position keep the port **137** and **138** closed. Either before or at the same time as the pistons are moved, both sliding valves **118** and **119** are displaced to the full extent of their stroke in opposite directions to each other.

By means of a canal **140** the port **137** is connected to the compression chamber **139** in order to allow oil to flow from said compression chamber into one of the upper compartments (so as to increase the pressure in one of the bearers) when the sliding valves **118** and **119** are moved from their middle position. A canal **141** connects the port **138** to the compression chamber **142**, so that at the same time oil can flow from this compression chamber to another upper compartment.

The suction chamber **143** of the cylinder casing, by means of a canal **144**, is in communication with a groove **145** located in the housing of sliding valve **118**, while the suction chamber **146** is provided with an excavation **147** (Fig. 25) which connects with the groove **148** in the housing of sliding valve **119**. When the sliding valves **118** and **119** are in their middle positions, the compression chambers of the cylinder casing, as well as the suction chambers, do not communicate with any of the compartments or bearers.

When by the action of the slinger the sliding valve **117** moves in a certain direction and the sliding valve **118** goes to the right and the pistons move, the wide annular groove **149** in this latter sliding valve then connects the port **137** with the port **150**, so that oil from the compression chamber **139** is pressed through **140**, **137**, **149** and **150** into the upper compartment **151**. The pressure in this compartment is thereby increased and consequently the pressure in the outer bearer communicating therewith through **131**, **130**, **135**, **129**, **127** and **125** will also increase.

At the same time, the other sliding valve (**119**) being displaced to the left, oil is pressed from compression chamber **142** through **141**, **138** and **152** into the upper compartment **153**, whereby the pressure in the bearer connected to this compartment **153** is increased.

The displacement of sliding valve **118** to the right, as already mentioned, causes connection to be made between a groove **154** in said sliding valve and a groove **145** (which is connected by the canal **144** to the suction chamber **143**). By means of space **155**, which connects with grooves **154** and **156**, the groove **154** is brought into connection with one of the canals **126**. Communication is thus established between **143** and said canal **126**, and the pressure decrease taking place in **143** causes also a decrease in pressure in the inner bearer connected to that canal (**126**) by means of one of the flanges **125** (not shown here). The canal **127** (which is connected by means of a flange **125** with aforementioned canal **126**) being closed by the sliding valve **118**, the decrease of pressure in the suction chamber **143** cannot cause a pressure decrease in a upper compartment, so that the decrease of pressure caused in the suction chamber **143** is confined solely to an inner bearer, said suction chamber and bearer being in communication with each other through **144**, **145**, **154**, **155**, **156**, **126** and a flange **125**.

In a similar manner, the suction chamber **146** which communicates with the fourth bearer by means of **147** and **148** and through the hollow of the other sliding valve (**119**) causes a pressure decrease in that bearer. Consequently, when the pistons are displaced from their resting position the pressure in two of the bearers increases and that in the other two decreases, while depending upon the direction in which the sliding valve **117** is displaced (to bring the pistons into action) the displacement of sliding valves **118** and **119** takes place either to the right and left, or to the left and right.

In order that the sliding valves **118** and **119** be kept exactly in their mean position when driving straight ahead, and to prevent shocks, the spring devices **157** are included which are provided with small air cushions.

When the pistons are in their resting position and the sliding valve **117** is in its middle position, the chamber **158** is always under such pressure that the pistons are kept in the position as shown.

Activated, for instance, by a slinger, the sliding valve **117** operates in approximately the same manner as the sliding valve of Fig. 13. This sliding valve **117** (Fig. 31) regulates the passage of compressed air to and from chambers **158** and **161** through **159** and **160**, respectively. According as the car turns to the right or to the left, sliding valve **117** admits compressed air into canal **162** or canal **163**, whereby the sliding valves **118** and **119** then attain such a position that the bearers are brought into communication properly with the compression and suction chambers in the cylinder casing as required for the direction of the turn.

When after its displacement the sliding valve **117** returns to its middle position, the canals **162** and **163** are covered by it and no air can flow back; thus the sliding valves **118** and **119** are not yet able to return to their middle position, but activated by the spring device **157** they will do so as soon as the pistons again attain their resting position because the canals **164** and **165** are then uncovered and communicate with the chamber **161** from which discharge takes place. The compression chambers **139** and **142** are then again entirely filled up with oil.

In order to obtain quick displacement of the sliding valves **118** and **119**, the canals **162** and **163**, which admit compressed air, are in comparison with the channels **166** of larger cross section, so that only a small part of the air supplied through **162** or **163** can escape.

To obtain a quick discharge of the air, which has served for displacement of the sliding valves **118** and **119** a canal **167** is so located that at the commencement of the discharge the outflowing air meets with practically no resistance.

In order that the two factors previously mentioned—centrifugal force and the commencement of slanting to a side—may co-operate with each other in the alteration of the pressure in the bearers, a second sliding, **168**, is included in the housing of sliding valve **117**. The sliding

valve 117 is moved by the slinger 3 and sliding valve 168 is activated by the slant to a side of the body of the car.

To keep the pistons in their resting position when driving straight ahead compressed air is brought to the required pressure by a reduction valve 169, and through a canal 170 and a groove 171 led into the sliding valve 117 and further into chamber 158 through canal 159, while compressed air (not reduced in pressure) reaches a wide groove 173 in this sliding valve 117 through a canal 172. When 117 moves to the right or to the left, said compressed air will flow from 173 into 162 or 163 and reach the groove 177 in sliding valve 168 through 174 or 175 and through 176.

If now the aforesaid factors—centrifugal force and slanting to a side—cooperate, so that the two valves 117 and 168 are displaced towards each other and the air supply through 170 and 171 is thereby cut off, compressed air (not reduced in pressure) from 172 will, through 173, 174, 176, 177 and 178, reach the groove 171, and thence through the inner spaces of the sliding valve 117 and through canal 160 flow into chamber 161.

The air supply through 170 and 171 is also cut off if due to the aforesaid factors the two valves 117 and 168 be displaced away from each other, in which case compressed air (not reduced in pressure) will reach the groove 171 through 173, 175, 176, 177 and 179, and thence flow into chamber 161 through canal 160.

As soon thereafter as one of the co-operating factors already referred to ceases to exist, so that one of the sliding valves 117 or 168 has returned near to its middle position, the aforementioned supply of compressed air is cut off.

If in making a sharp turn when driving fast adequate alteration of pressure has taken place in the bearers, the car will, when for instance its speed is reduced, begin to slant towards the inner side of the curve. Sliding valve 168 will then be moved towards the side opposite to that in which it cooperates with the sliding valve 117 which is displaced by the slinger. Sliding valve 168 will in that position, without necessitating any change in the position of 117, then allow the air flowing back from chamber 161 to escape through the sliding valve 117 and one of the canals 178 or 179 until the alteration in pressure is reduced in extent as required.

In order that such escape of air may take place gradually and not suddenly, the ends of the canals 178 and 179, near the valve 168, are of a special shape.

In order that a sufficient quantity of oil can always be maintained in the cylinder casing and in the compartments above it, the spaces 155 in the hollow sliding valves 118 and 119 can be of large volume and function as follows: When the sliding valves 118 and 119 are in the middle position, a channel 180, through which oil is supplied under pressure, communicates with the groove 154 which groove is in communication with the space 155. Each time the sliding valve is in the middle position the compressed air in space 155 is thus further compressed by the oil flowing from canal 180, so that said space 155 is partly filled with oil, and when alternately making turns to the right and to the left, this oil, when repeatedly flowing out of the spaces 155 of sliding valves 118 and 119, is divided between the four upper compartments. Any excess of oil reaching these compartments will escape into the bearers and from there be discharged.

Canals and ports from which oil flows out of the cylinder casing into the air compartments and back can in different ways be so shaped and located that no air bubbles are conveyed along with the oil flowing back into the cylinder casing, and to prevent such conveyance of air, the upper compartments are provided with fences 61 (drawn in Fig. 22).

Instead of a slinger and an arm 27, as described in the foregoing, other devices operating under centrifugal force as, for instance, one or more rollers or balls moving along a fixed path, or a liquid such as, for example, mercury, can be used to activate the equipment serving for alteration of the pressure in the bearers.

It is also evident that various changes, modifications, variations and substitutions might be resorted to without departing from the spirit and scope of the invention.

BALTUS BOULOGNE.
ANTONIE PIETER BOULOGNE.

PUBLISHED

MAY 25, 1943

BY A. P. C.

B. BOULOGNE ET AL

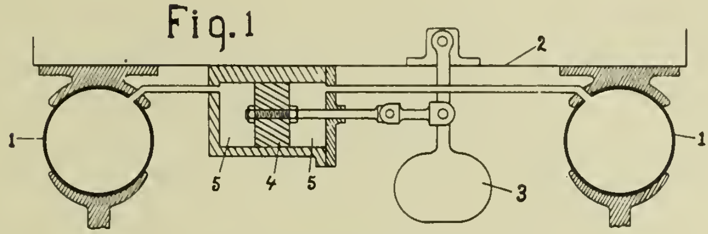
MEANS FOR REDUCING THE SLANTING TO A SIDE OF PNEUMATICALLY SUPPORTED VEHICLES

Filed Oct. 12, 1940

Serial No. 361,008

4 Sheets-Sheet 1

Fig. 1



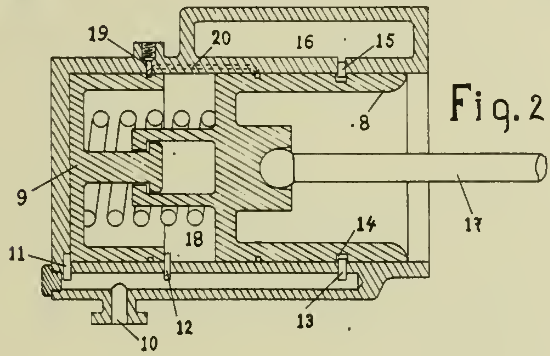
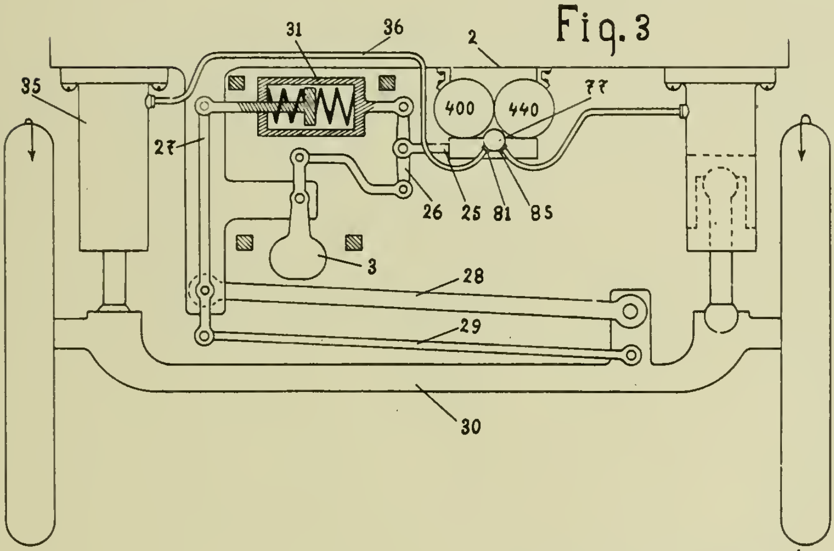


Fig. 2

Fig. 3



Walter Boulogne.

Antonio Pietro Boulogne

PUBLISHED

MAY 25, 1943

BY A. P. C.

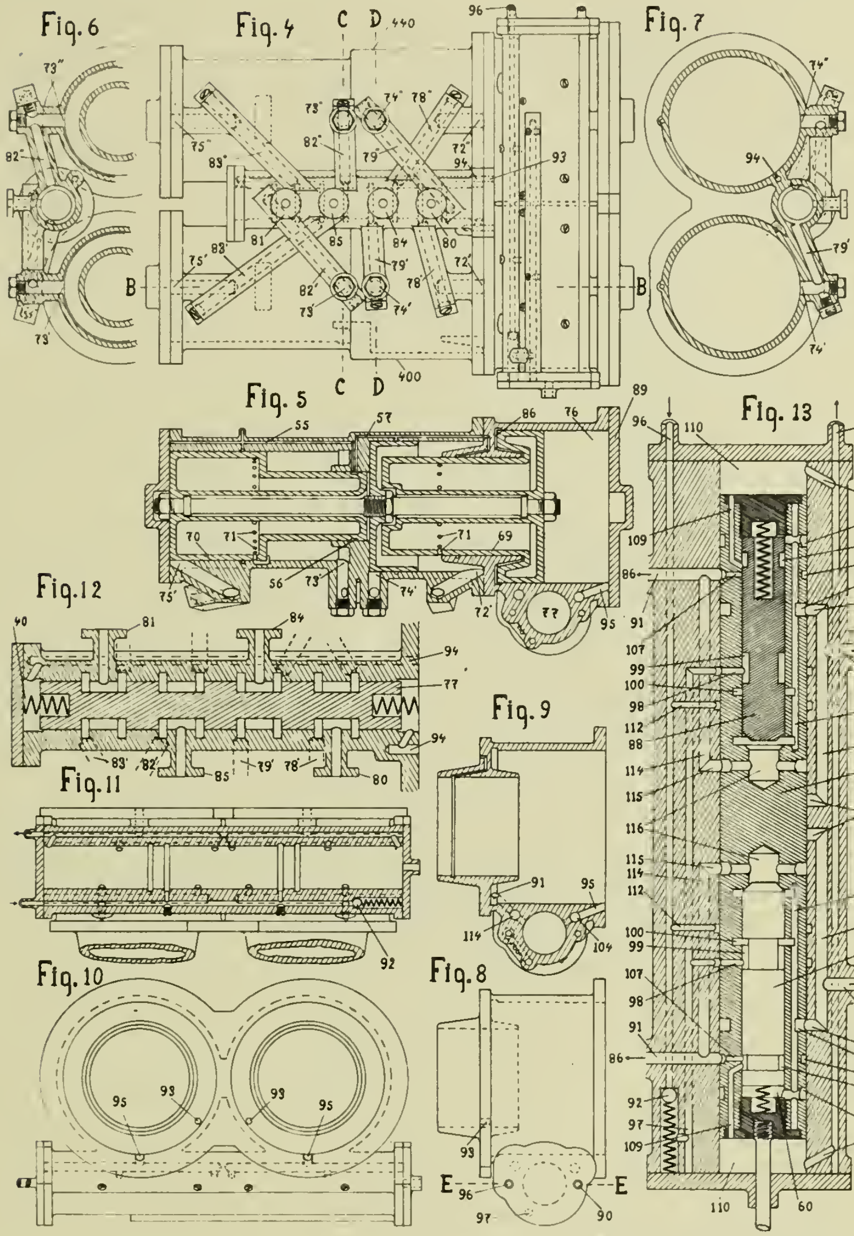
B. BOULOGNE ET AL

MEANS FOR REDUCING THE SLANTING TO A SIDE OF PNEUMATICALLY SUPPORTED VEHICLES

Filed Oct. 12, 1940

Serial No. 361,008

4 Sheets-Sheet 2



Antoine Vidal Boulogne

PUBLISHED
MAY 25, 1943
BY A. P. C.

B. BOULOGNE ET AL
MEANS FOR REDUCING THE SLANTING TO A SIDE OF PNEUMATICALLY SUPPORTED VEHICLES
Filed Oct. 12, 1940

Serial No.
361,008

4 Sheets-Sheet 3

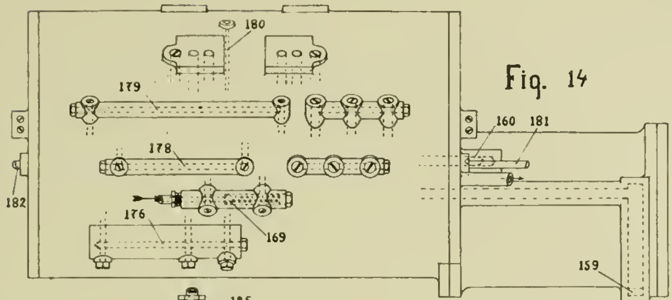


Fig. 14

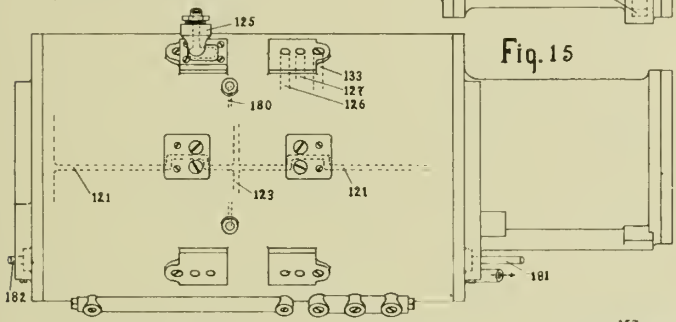


Fig. 15

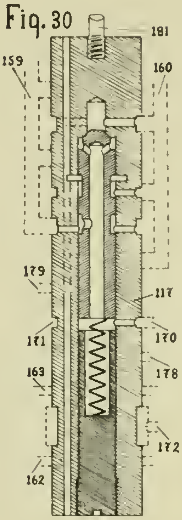


Fig. 30

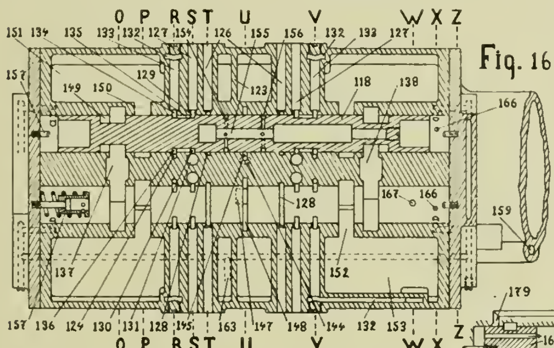


Fig. 16

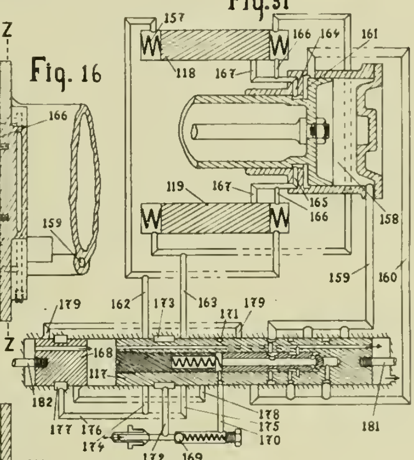


Fig. 31

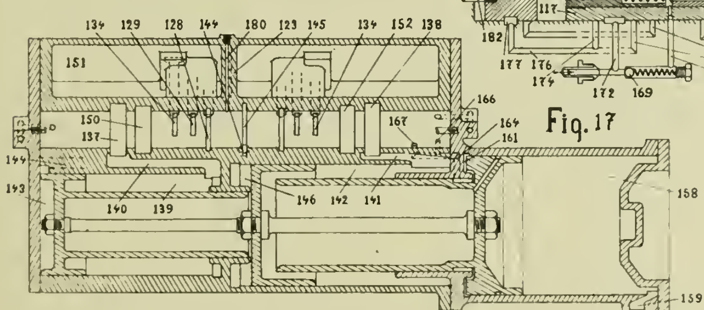


Fig. 17

Antoine Pieter Boulogne.

PUBLISHED

MAY 25, 1943

BY A. P. C

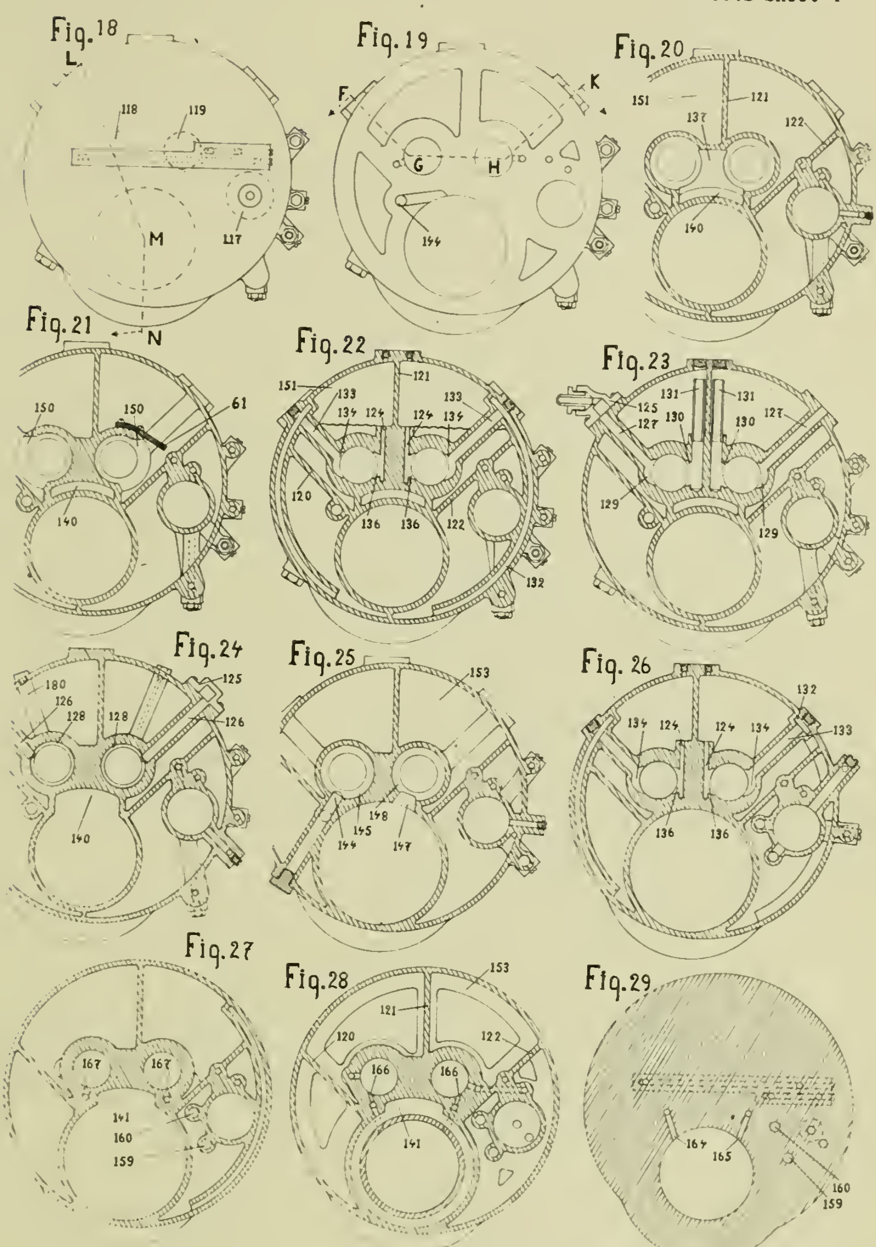
B. BOULOGNE ET AL

MEANS FOR REDUCING THE SLANTING TO A SIDE OF PNEUMATICALLY SUPPORTED VEHICLES

Filed Oct. 12, 1940

Serial No. 361,008

4 Sheets-Sheet 4



Published May 25, 1943

Serial No. 361,145

ALIEN PROPERTY CUSTODIAN

HAND-OPERATED CASH REGISTER

Biagio Beria, Turin, Italy; vested in the Alien Property Custodian

Application filed October 14, 1940

This invention relates to a cash register with hand operation.

An object of this invention is to provide a compact arrangement of the various members.

A further object of this invention is to provide a safety device for preventing operation of the machine when the setting levers instead of being in their correct position are in an intermediate position.

A further object of this invention is to provide means for insuring a perfect visibility of the item set both by the operator and the supervising personnel who can check from a distance whether on each operation performed the machine has been duly operated so as to carry out its full normal cycle.

These and further objects of this invention will appear from the following description, in which reference is made to the accompanying drawing, in which:

Figure 1 is a partial axial section of the machine along the broken line I—I of Figure 3.

Figure 2 is a section on line II—II of Figure 3.

Figure 3 is a cross section on line III—III of Figure 1.

Figure 4 shows a setting lever and Figure 5 shows a sector connected with the setting lever.

Figure 6 is a cross section on the line VI of Figure 1, showing the safety device for preventing actuation of the handle if the setting levers are not in their correct position and the crank mechanism is at the cycle end.

Figure 7 is a section on line VII of Fig. 1 and shows the counter operating mechanism and means for uncoupling it when the operations of "credit" and "withdrawal" are performed, the counter remaining in its coupled position during the "cash" and "part payment" operations.

Figure 7*bis* shows the setting dial for the various operations relating to Figure 7.

Figure 8 is a section on line VIII of Figure 1, showing the mechanism for performing the registering operations, with the possibility of subdividing them into four classes for the items to be registered on the machine and effecting registration of 5 cents cashed.

Figure 9 shows the setting dial for the various operations relating to Figure 8.

Figure 10 shows the lever producing in a determined position delivery of the ticket, and the lever for setting the "cash," "partial payment," "on credit" and "withdrawal" operations, which in its two last mentioned positions automatically produces delivery of the ticket even in case the special ticket delivery lever is not yet in the "delivery position."

Figure 11 is an axial section of the detail shown in Figure 10.

Figures 12, 13 and 14 are detail views of the device for checking the machine operation from a distance.

Figure 15 and 15*bis* are detail views of the machine lock which is operated when it is desired to read the counter by using the key.

Figures 16 and 17 are a side and front view, respectively, of the device for introducing the ticket roll.

Figure 18 shows a detail of the device for centering the successive members, setting levers, levers carrying position rollers, by means of a comb which holds the setting levers, in the correct position,

Figure 19 is a partial perspective view of the machine, showing the gradually increasing space between the numerals on the dials of the setting levers which advantageously improves the visibility thereof, and the tiltable lid acting as a visor for improving the visibility of the totalizer;

Figure 20 is a detail view of the setting lever dial;

Figure 21 is a perspective view of the machine.

Referring to the drawings, **1** (Figures 1, 2 and 3) denotes the main shaft on which are loosely mounted the setting levers formed by a handle **2** and a circular portion **2'** (Figure 4) toothed at its periphery. The same shaft has loosely mounted thereon the toothed sectors **3** (Figure 5) adapted to transmit the setting movement imparted to the levers **2**, to the totalizer, of which numeral **4** denotes the shaft carrying the driving pinions. Two arms **5** are further keyed on the shaft **1** and carry a bar **6** adapted to restore the sectors **3** to their initial position when the shaft **1** is rotated causing the machine to perform its operating cycle on operation of the crank **7**.

The setting levers **2** and sectors **3** of each pair are connected together by a spring **8** which holds the sectors in a determined position against the setting levers by causing them to bear by their edge **3'** (Figure 5) against a stop tooth **9** on each setting lever.

The sectors keep in contact with said stop tooth as the items are set by actuation of the setting levers but the totalizer remains inoperative, for it is kept in a raised position with respect to the sectors **3**, in which its pinions do not mesh with the teeth on the sectors.

When the items are set, the machine is started

by the crank 7 and the totalizer is lowered by the fact that the shaft 4 of the totalizer (Figure 7) is carried by suitable arms 10 swinging about a shaft 11, the arms being actuated by a link 12 connected at 13 to the longer arm 14 of a bell crank lever 15 oscillating about a pivot 15' and the shorter arm of which carries a roller 16 riding on the cam keyed on the shaft 18 which is actuated on rotation of the crank by means of the pinion 19 (Figure 6), the intermediate wheel 20 and toothed wheel 21 keyed on the shaft 18.

Starting of the crank 7 on each operating cycle of the machine oscillates the bell crank lever 15 through the gradient on the cam 17, lowers the link 12 and moves downwardly the arms 10 carrying the totalizer, causing the pinions T of the totalizer to engage the teeth d on the sectors.

The setting levers 2 carry at the periphery of their circular portion 2' teeth d' meshing with the pinions 22 (Fig. 3) which actuate the usual wheels carrying the numerals adapted to form the figure set, visible at the rear towards the public (not shown).

The circular portion 2' is provided with a further set of teeth d'' meshing with a pinion 23, each being connected with the corresponding wheel t (Figures 2 and 3) which carries the numerals adapted to form the figure set, visible at the front on the operator's side. As the numeral wheels for front reading are arranged at the lower portion of the machine, a further important advantage is secured both as regards cost and size, on account of the fact that each wheel t is keyed on a tubular shaft 25 carrying a printing disk 24, the tubular shafts being concentrically arranged on the same axis. The position of the wheels t permits the operation effected to be read at the front in a particularly convenient low position (see Fig. 21).

The circular portion 2' of the setting levers carries a further set of teeth 26 which are wedge-shaped; a roller 27 carried by an arm of a bell crank lever 28 rests in the V-shaped recess between said teeth, the other lever arm being acted upon by a spring 29 which tends to resiliently hold the roller between the teeth 26, so that the bell crank lever oscillates about the axis 30 on operation of the setting levers 2.

The operating cycle of the machine actuated by the crank 7 shall now be described.

The crank 7 is keyed on the polygonal end of the hub of a pinion 19 (Fig. 1) which is in turn loosely fitted on a bush 31 in which the end of the shaft 1 is freely mounted. On rotation of the crank 7, the latter carries along the pinion 19 which actuates through the toothed wheels 20 and 21 (Fig. 6) the cam shaft 18 carrying besides the totalizer driving cam 17 a cam 32 (Fig. 3) which actuates the arm 33 of a lever pivoted at 34, the other arm of which is in the shape of a toothed sector 35 meshing with teeth 36 of a toothed sector forming part of one of the two arms 5.

In this manner, rotation of the crank 7 first throws into gear by means of the cam 17 the totalizer pinions with the sectors 3, then oscillates through the cam 32 the arms 5 and bars 6 connecting them, restoring the sectors 3 and transmitting to the totalizer the figure previously formed by the setting levers 2. The rollers 27 are pushed by the spring 29 against wedge-shaped teeth 26 and enable snapping of each tooth, which corresponds to the displacement of a numeral on operation of the setting levers, to be heard. A bar 37 rests on an arm of the levers 28 and is carried by arms 38 keyed on the shaft 30 (Fig. 1) having keyed on its end a lever 39 (Fig. 6) which cooperates by its other end with a foot 40 of a lever 41 loosely mounted on a pivot 42 and pressed by a spring 43 tending to keep the tooth 44 lifted and released from the pinion 19.

When setting a figure by means of the levers 2, if the numerals do not reach their correct position as required with the roller 27 in the recess between the teeth, the roller remains on the apex of a tooth, the bar 37 is moved as the roller 27 is raised and causes the lever 39 keyed on the same shaft 30 as the arms 38 of the bar 37, to oscillate the lever 41 and carry the tooth 44 into engagement with the pinion 19, whereby the crank 7 is locked and the operation cannot be performed.

In this case, the operator notices the wrong setting and can immediately place the machine in order to make its operation possible.

The machine is provided with a device for keeping the setting levers locked against the action of springs 8, as the operating cycle of the machine is started by the crank. For this purpose, each setting lever is provided with a lever 45 (Figs. 2 and 3), of which the hub 46 is keyed on the shaft 15. The levers 45 are pressed by a spring 48, which keeps one end thereof against a cam 49 carried by the camshaft 18, while the other lever end is formed with a tooth 50 adapted to engage under the action of the cam 49 the corresponding pinion 23 fixedly connected to the drum for front reading and directly meshing with the set of teeth d'' on the corresponding setting lever 2. As the crank 7 starts rotating, it causes the cam 49 to promptly lift the end of the lever 45 and lock the setting lever 2 as described above.

As the crank completes the full operating cycle of the machine, which corresponds in the example shown to two full turns of the crank, a device which shall now be described automatically stops the crank. This device consists of a lever 51 (Figs. 1 and 6) oscillating on the pivot 52, one end of which is actuated by a pin 53 carried by the toothed wheel 21 which performs one turn as the crank turns twice and tends to lift said end against the action of the spring 54. The other end of the lever 51 comes under the tooth 55 solidly fixed to the pinion 19 as the opposite end of said lever 51 is lifted by the pin 53. On the last instant of its oscillation, the crank is stopped under the action of the tooth 55 by the end of the arm of the lever 51. As soon as the pressure of the hand tending to rotate the crank ceases, the pressure between the tooth 55 and the end of the lever 51 ceases also, and the spring 54 releases the lever from the tooth 55, again setting free the crank which is ready to perform another cycle.

Actuation of the crank 7 for a new cycle is made possible by the fact that on the last short length of the crank movement the pin 53 moves beyond the end of the arm of the lever 51, releasing said arm.

The first of the setting levers 2, which will be referred to as $2a$ (Fig. 7) is deprived of the sector 3 (while a sector 3 is coupled with all other levers by means of the spring 8) and has two sets of teeth only, viz. a set d'' for connection with the associated pinion 23, and a set of teeth 26' having twice a pitch which is twice the pitch of the teeth 26 on the other levers, said lever $2a$ performing the function of setting, instead of the nu-

merals, the type of operation to be performed, viz. "cash," "partial payment," "on credit" and "withdrawal" (Figure 7 bis) in accordance with the four snaps of the roller 27.

The connection with the corresponding pinion 23 permits actuation of a wheel, which repeats for front reading the inscriptions or symbols corresponding to the above operations ("cash," etc.) and actuation of the corresponding printing disk directly keyed by means of the tubular shaft 25. The circular portion of the lever 2*a* further carries a pivot 55 projecting laterally thereof (Figure 7) which is ineffective when the lever moves from the "cash" to the "partial payment" position, but strikes against the lever 12 on movement from the "partial payment" to "on credit" or "withdrawal" position, the lever 12 then disengaging from the pin 13 on the lever 14, so that the cam 17 no longer acts on the totalizer to bring it into engagement. In performing the "on credit" and "withdrawal" operations, the cycle of the machine does not affect the totalizer.

The setting lever 2 (Fig. 8) situated at the end remote from the above described lever 2*a* has its sector 3*a* provided with a pawl 100 pivoted at 101 and serving to introduce into the totalizer the 5 cent sum and actuate the pinions for this operation.

Adding of the cents must of course be completed, as will be seen from the dial (Figure 9) when the setting lever has reached numeral 5 or one of the following numerals 5A, 5B, 5C, 5D which correspond to 5 cents to be added in the particular case of operations of class A, B, C, D respectively. When operations of classes A, B, C, D must be performed without adding the 5 cents, the setting lever is behind numeral 5.

For the positions over numeral 5, during actuation of the setting lever and movement of the sector 3*a* under the action of the spring 3*a*, the pawl 101 moves underneath the collecting bar 6, which cannot return the sector 3*a*, so that the 5 cents are not added up in the totalizer. When the setting lever is brought to the position 5, the pawl 100 strikes against the pin 102 and is lifted within the path of the angle bar 103 carried by the bar 6, which on its return stroke engages the pawl 100 and returns the sector 3*a* to zero, thereby adding up in the totalizer the figure 5.

If the setting lever is brought to the position 5A, 5B, 5C, 5D, the sector 3*a* always stops in the position 5, in which it is retained by the pin 104 and the figure 5 is again added up in the totalizer.

A ticket control lever 66 (Figs. 10 and 11) is formed at its inner end with a boss 66′ cooperating with the end 64*a* of a pawl pivoted at 65 on a wheel 63 and formed with a tooth 64 which, when it is held by a spring *m* in the notch 62′ in the shaft 62, feeds the paper by causing the wheel 63 to be keyed on the shaft 62 by the tooth 64, thereby transmitting to the shaft 62 through the wheels 63 and 63′ the motion of the camshaft 18 on each cycle of the machine. In the position of the lever 66 shown in Figure 10, the pawl holds the wheel 63 keyed on the shaft, while on displacing upwardly the lever 66, the boss 66′ on the latter moves the pawl releasing the tooth 64 and disconnecting the wheel 63, thereby preventing delivery of a ticket on each cycle of the machine. The arrangement is such that, on performing "on credit" and "withdrawal" operations by bringing the lever 2*a* to the corresponding positions, Fig. 7, the lever, if not already in the position shown in Figure 10, is automatically brought thereto for the delivery of the ticket. For this purpose, the circular portion of the lever 2*a* is formed with a pin 67 which, when the lever is brought in the "on credit" and "withdrawal" position, reaches the foot 66*a* of the lever 66, if the latter is in its raised position, bringing it down with its outer end to the ticket delivery position, in which the pawl 64*a* has its tooth 64 engaged in the corresponding recess in the shaft 62.

The ticket printing and delivery device shown in Figures 16 and 17 enables an easy rechange of the paper roller by introducing one end unwound from the roller between the printing cylinder 69 and pressure cylinder 70 at the same time as the paper roller is mounted on the supporting pivot 68. The printing roller 69 has a sector of a smaller diameter which, in the inoperative position of the machine, is in front of the pressure cylinder 70 (Fig. 16), enabling introduction of the unrolled paper end during fitting, as described above.

71 denotes the paper roller supporting surface and 72 denotes the blades cutting the ticket near the outlet S. The sector of a larger diameter of the printing roller 69 feeds the paper by the desired ticket length and at the same time advertisements or the like are printed, if desired.

The printing rollers 24 (Fig. 2) for printing on the ticket and check tape the figures and inscriptions are lodged in the frame 73 (Fig. 16). The record on the check tape may be inspected through the opening C (Fig. 21).

Figure 15 shows the device for locking the machine on reading of a sub-total or grand total. For this purpose a lock 61 with two keys is provided; the shorter key permits reading of the totalizer only, while the longer key further permits to zeroise the totalizer. The device comprises a sector 75, of which the outer profile 76 is formed with a step towards a projecting portion 77 and an opening 78, a roller 79 and a notch 74. The roller 79 acts on the profile 80 of a lever 81 pivoted at 82 and pressed by the spring 83, which tends to keep the tooth 84 released from the pinion 19. By fitting either key into the hole 74 in the lever 75, the roller 79 immediately lowers the tooth 84, causing it to engage with the pinion 19. At the same time the step on the profile of the sector 75 lifts the lever 85 which, through a lever 85′, lifts the lid 86 (Fig. 19) that dissimulated the totalizer reading. If the key introduced into the lock 61 is the longer one, the sector 75 is free to rotate further, till its opening 78 comes into alignment with a further lock 87, of which the key zeroises the totalizer.

The record of the number of grand total readings performed by the machine is visible through the opening Z in the casing (Fig. 21).

The machine is provided with a device (Figs. 12 to 14) for checking its operation from a distance, comprising a drum 88 of which the cylindrical surface is divided into variously colored sectors 88′ visible through a suitable opening 90′ in the casing 89 of the machine. The head portion of the drum is also divided into sectors 88″ of different colors visible through an opening 90 in the side wall of the casing 89 of the machine. Motion is transmitted to the drum 88 from the camshaft 18 through gearing 105, cam 106, lever 107, ratchet gear 108 and toothed wheels 109. The width of the colored sectors corresponds to the angular displacement of the drum 88, so that only on completion of a full cycle a change in color takes place and is visible at a distance for checking purposes.

The construction of the machine is such that the various movable members may be perfectly centered on their shafts without any special arrangements and in a very easy and simple manner, as a centering device according to the invention and described hereinafter may fulfil the purpose for various interconnected members.

Figure 18 shows the device used in connection with the setting levers **2** and levers **28**. As will be clearly seen from the drawing, the setting levers **2** are simply fitted on the shaft **1** and one or a plurality of combs **91** having cuts **92** hold in position and guide said levers during operation. The setting levers **2** fit within notches **93** cut in an extension **94** of the levers **28**. The hub of the latter is made of U-bent sheet metal and the notched extension **94** is formed from the sheet metal portion betwen the two flanges **28'** of the U.

The distance between the numerals or letters on the dials **110** on which the pointers *i* (Fig. 19) of the setting levers **2**, **2*a*** move, gradually increases from the center towards both ends, as will be clearly seen from Figure 20. This arrangement is of great importance, because (see Figure 19) the numerals placed towards the ends of the dials are as visible as those placed at the center, notwithstanding the thickness of the pointers *i* on the levers **2**.

BIAGIO BERIA.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

B. BERIA
HAND-OPERATED CASH REGISTER
Filed Oct. 14, 1940

Serial No.
361,145
7 Sheets-Sheet 1

Fig. 1

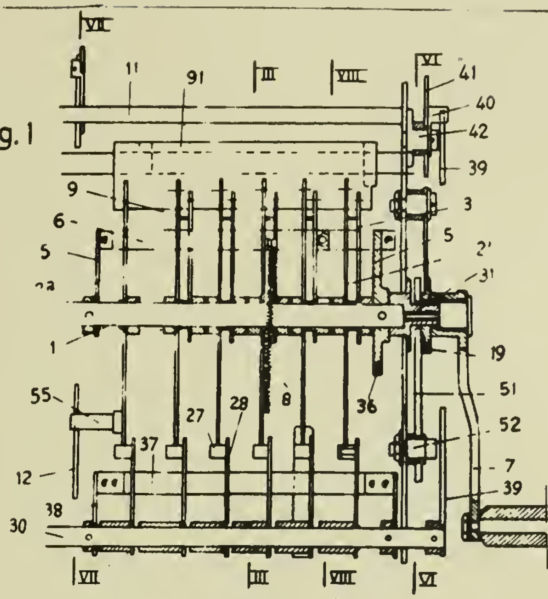
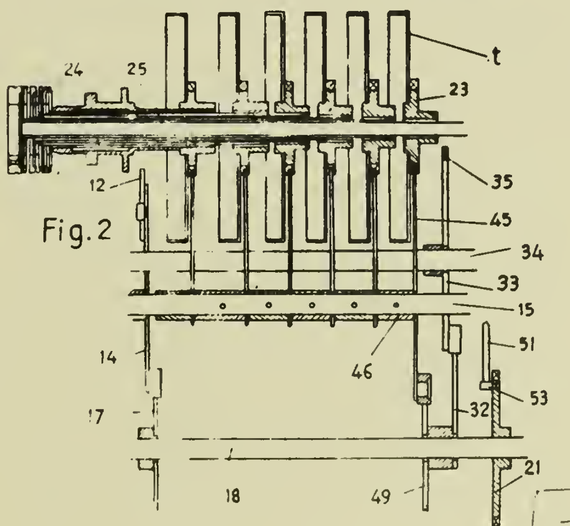


Fig. 2



Inventor,
B. Beria

By: Glascock Downing & Seebold
Attys.

PUBLISHED MAY 25, 1943. BY A. P. C.

B. BERIA

HAND-OPERATED CASH REGISTER

Filed Oct. 14, 1940

Serial No. 361,145

7 Sheets-Sheet 2

Fig. 3

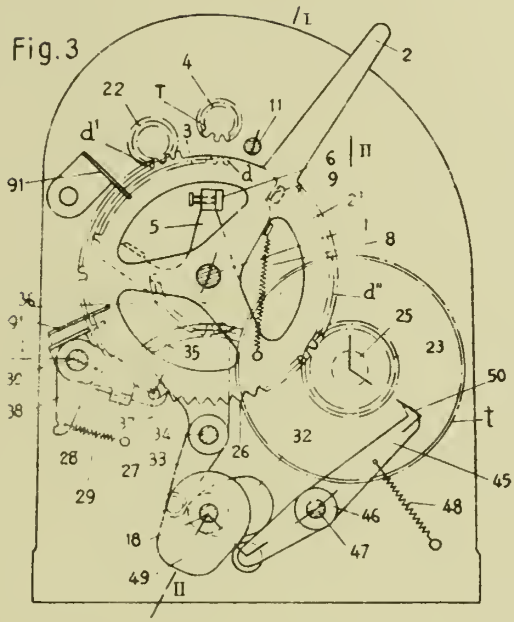


Fig. 18

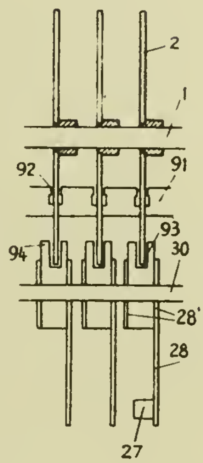


Fig. 4

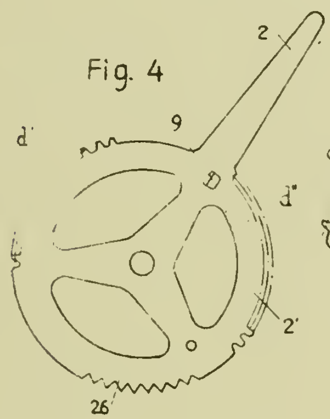
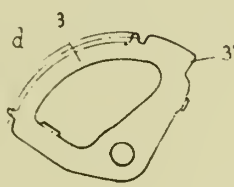


Fig. 5



Inventor,
B Beria

By Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

B. BERIA
HAND-OPERATED CASH REGISTER
Filed Oct. 14, 1940

Serial No.
361,145
7 Sheets—Sheet 3

Fig. 6

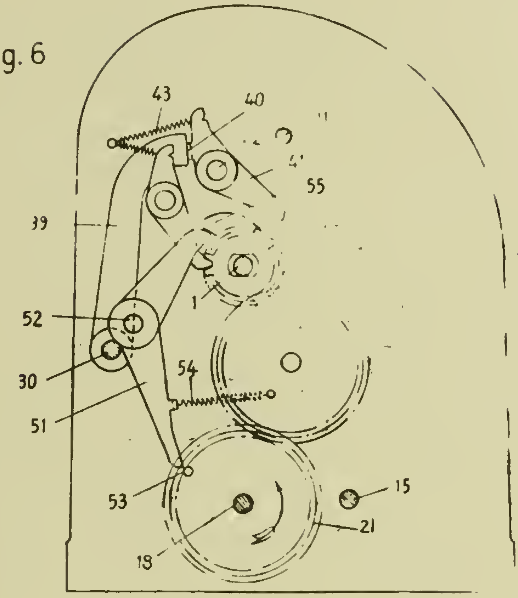


Fig. 7

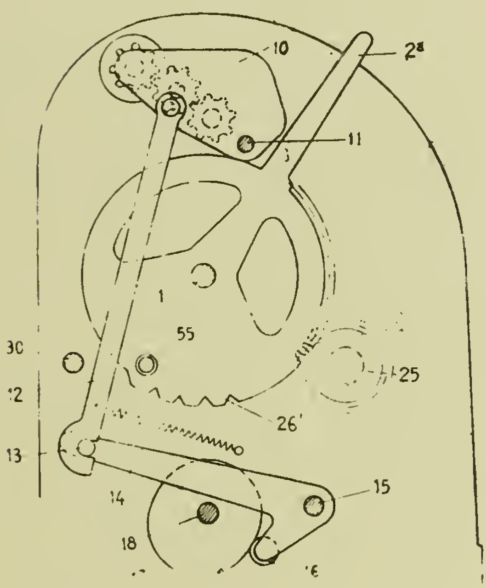


Fig. 7bis

Inventor:
B. Beria

By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

B. BERIA
HAND-OPERATED CASH REGISTER
Filed Oct. 14, 1940

Serial No.
361,145
7 Sheets-Sheet 4

Fig. 8

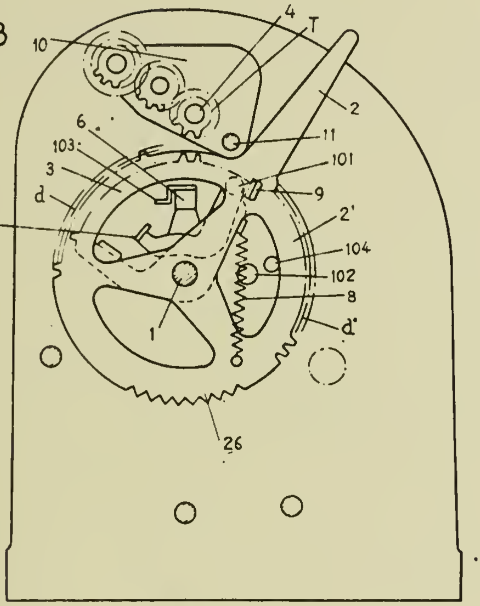


Fig. 9

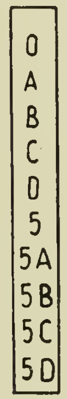


Fig. 15

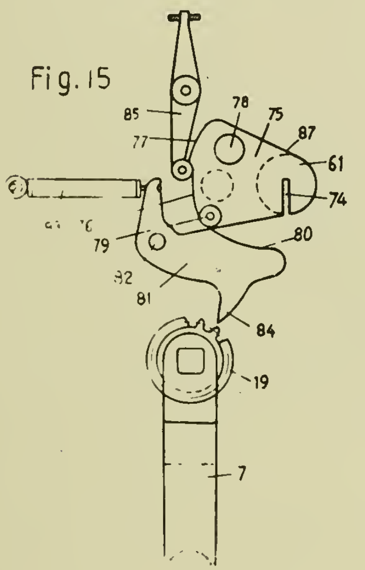
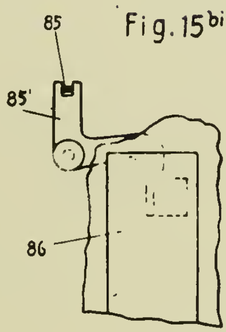


Fig. 15 bis.



Inventor,
B. Beria

By Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

B. BERIA

HAND-OPERATED CASH REGISTER

Filed Oct. 14, 1940

Serial No. 361,145

7 Sheets-Sheet 5

Fig 16

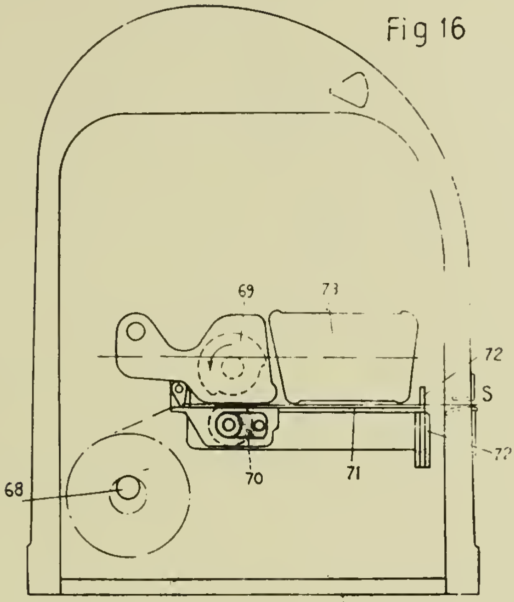


Fig. 17

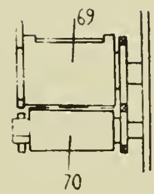


Fig. 11

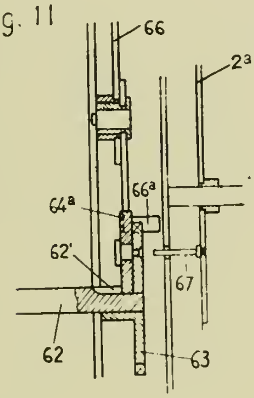
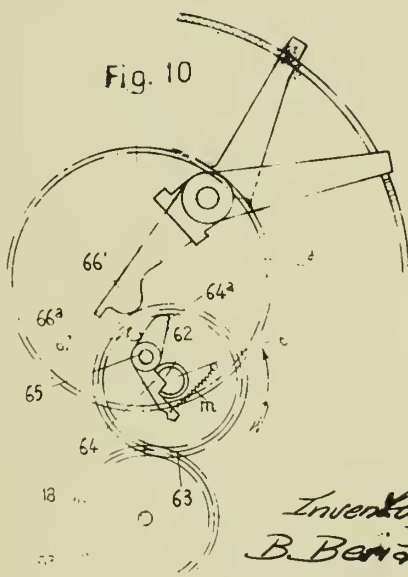


Fig. 10



Inventor,
B. Beria

By Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

B. BERIA

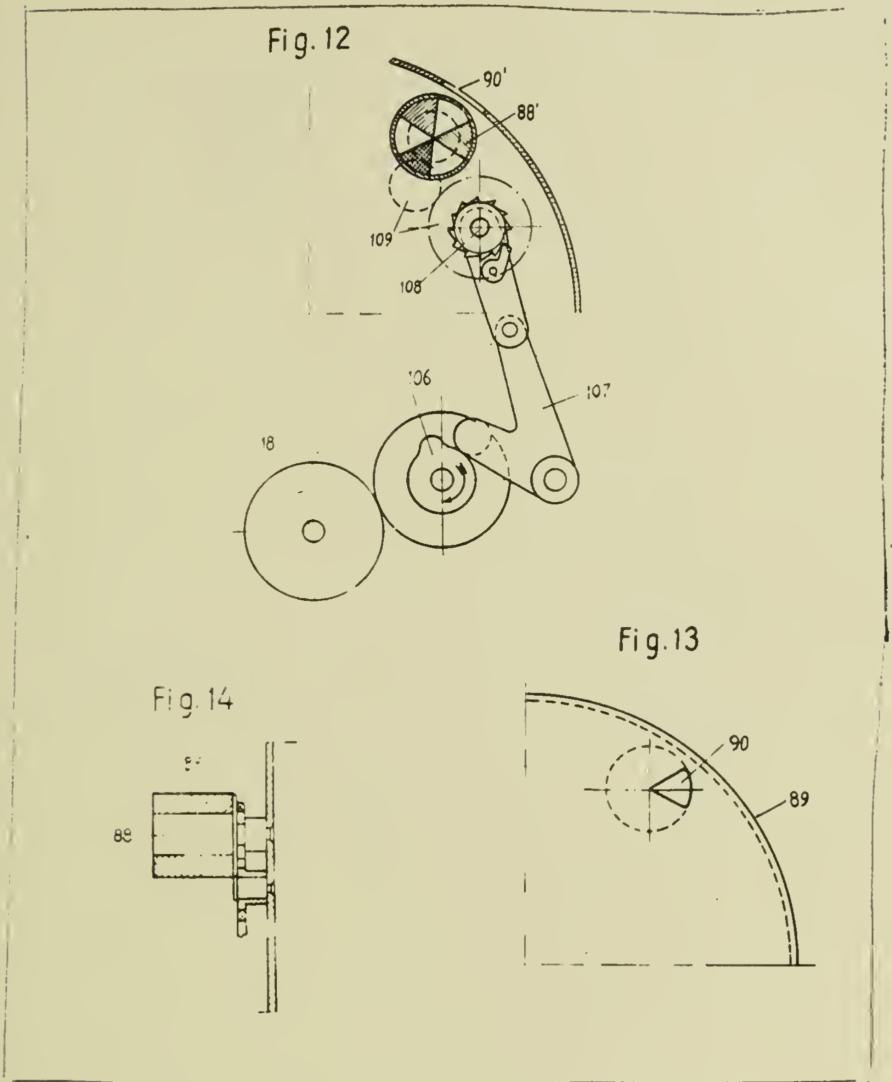
HAND-OPERATED CASH REGISTER

Filed Oct. 14, 1940

Serial No.

361,145

7 Sheets-Sheet 6



Inventor,
B. Beria

By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

B. BERIA
HAND-OPERATED CASH REGISTER
Filed Oct. 14, 1940

Serial No.
361,145
7 Sheets-Sheet 7

Fig. 21

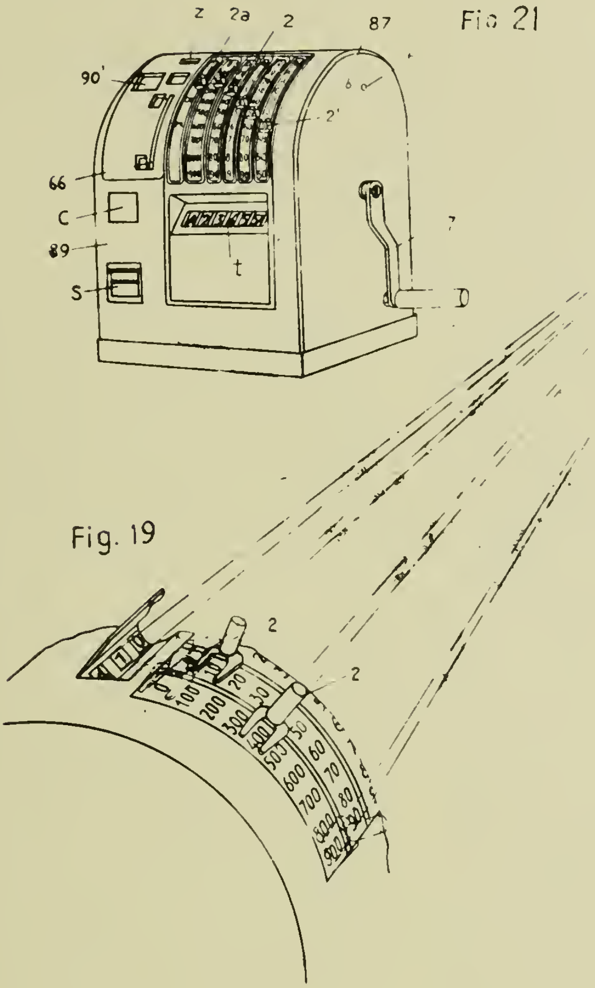
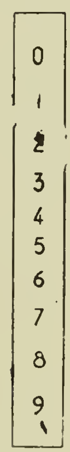


Fig. 19

Fig. 20



Inventor,
B. Beria

By Glascock Downing & Seebold
Attys

Published May 25, 1943 Serial No. 362,375

ALIEN PROPERTY CUSTODIAN

REMOVAL OF HYDROGEN SULPHIDE FROM GASES

Heinrich Koppers, Essen, Germany; vested in the Alien Property Custodian

Application filed October 23, 1940

This invention relates to the removal of hydrogen sulphide from coal distillation gases or the like and more particularly to the treatment of spent washing liquors with finely divided gases, such liquors being produced during the removal of hydrogen sulphide and other impurities from gases if the gas to be cleaned is brought into contact with a liquor containing compounds, absorbing sulphur, whereby the sulphur especially in elementary form is separated by treating the liquor with air or other oxidizing gases and the substances for absorbing the sulphides are reformed.

The present invention refers in particular to the activation of the spent washing liquors of the so-called Thylox - gas - purification - process in which the gas to be cleaned is treated with an alkaline solution of sulphur oxygen compounds of a metal belonging to the tin-group of the qualitative analysis, for instance with compounds containing arsenic, sulphur and oxygen. In this process the spent washing liquor is usually regenerated by a treatment with air in a tower-like vessel which is called thionizer. By means of the oxygen, the elementary sulphur is set free from the sulphur arsenic oxygen compound and the lower sulphurized arsenic oxygen compound, effective for the absorption of hydrogen sulphide is reformed. The elementary sulphur collects as a slurry or foam on the surface of the liquor in the thionizer and is separately recovered from the liquor.

In Letters Patent 2,141,047 granted to Koppers Company an improved contrivance for the activation of spent washing liquors is shown, a characteristic feature of said contrivance being to provide in the thionizer return channels, leading from the top of the liquor column down to the bottom of the thionizer in such a way that a flow-back of the washing liquor from the top of the thionizer to its lower part is rendered possible. By such a flow-back the undesired formation of large gas bubbles is decreased and the efficiency of the thionizer is improved correspondingly. Further the separation of elementary sulphur is considerably better if a larger quantity of finely distributed sulphur is present in the liquor and by a partial leading back of the liquor highly enriched with sulphur from the top of the thionizer into the lower part thereof, the concentration of elementary sulphur in the treating liquor is increased near the bottom of the thionizer, i. e. in that zone in which the fresh oxidizing gases have first come into contact with the liquor.

The inventor, however, has found that it is very difficult to distribute the spent washing liquor introduced freshly into the thionizer evenly within the ascending circulation current of liquor in said thionizer and it is the main object of the present invention to provide for such improvements that a uniform distillation of the spent washing liquor within the charge of the thionizer is arrived at and thus the oxidation of the liquor is considerably improved.

According to the invention the spent washing liquor leaving the gas scrubber is introduced into the thionizer at one or several places situated near the upper end of the said return channels of the thionizer or inside said channels in such a manner that the spent liquor flows firstly downwards with the returning liquor already treated in the thionizer, said mixture being highly enriched with elementary sulphur and it may be easily oxidised in a uniform manner and the utilisation of air is uniform all over the cross section of the thionizer, the formation of larger gas bubbles within the liquid column being considerably reduced.

The addition of the spent liquor to the scrubbing solution flowing downwards the scrubber has also the advantage that the circulation is assisted in the thionizer because the specific gravity of the liquid flowing off the scrubber considerably differs from that of the solution in the thionizer which latter solution has absorbed air to a high degree. By the method according to the instant invention the circulation of the scrubbing solution is thus assisted without any additional means being required.

With the above and other objects and features of my present invention in view, I shall now describe a preferred embodiment thereof on the lines of the accompanying drawing in which

Fig. 1 shows a thionizer in a vertical section and

Fig. 2 shows a horizontal cross section on line II—II.

The thionizer shown on the drawing comprises essentially a cylindrical container 1 in the bottom of which a perforated plate 3 or other means are provided for, serving for the distribution of air or other oxidising gases.

Below the plate 3 a compressed air pipe 10 is connected to the thionizer. The air introduced through pipe 10 into the tower enters the thionizer through the holes of the plate 3.

When in operation the plate may rotate round axis 5 for example at 200 revolutions per minute. The air forms thin jets if leaving the plate being at a standstill as shown on the left hand side

of Fig. 1. But a distribution of the air in individual fine bubbles is arrived at when the plate is rotating as to be seen on the right hand side of Fig. 1.

Furthermore means are provided in the thionizer in order to enable a return of the liquid from the upper part to the bottom of the tower in opposite directions to the ascensional movement of the liquid caused by the oxydation gases. For this purpose for instance a double jacket or a semi-circular sheet plate body 11 is fastened to the thionizer at its inner circumference so that pipe like hollow spaces are formed at the walls of the thionizer. Through these hollow spaces part of the liquid continuously flows from the upper part of the tower to the bottom.

At the upper end of the thionizer an overflow tank 12 is provided for in which the sulphur foam separating from the liquid settles down. The regenerated solution flows off through branch 13 while the sulphur foam may be discharged through pipe 14.

The spent liquor to be regenerated is introduced through pipes 2 from above into the return channels 11 so that the freshly added solution mixes intimately with the scrubbing solution being already in circulation and may enter the lower part of the thionizer interior from the lower end of the return channels 11. This method warrants a homogenous composition of the liquid to be regenerated when it comes into contact with oxidising air.

It is also possible to introduce the spent liquor flowing off the scrubber at another point into the return means.

HEINRICH KOPPERS.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

H. KOPPERS
REMOVAL OF HYDROGEN SULPHIDE FROM GASES
Filed Oct. 23, 1940

Serial No. 362,375

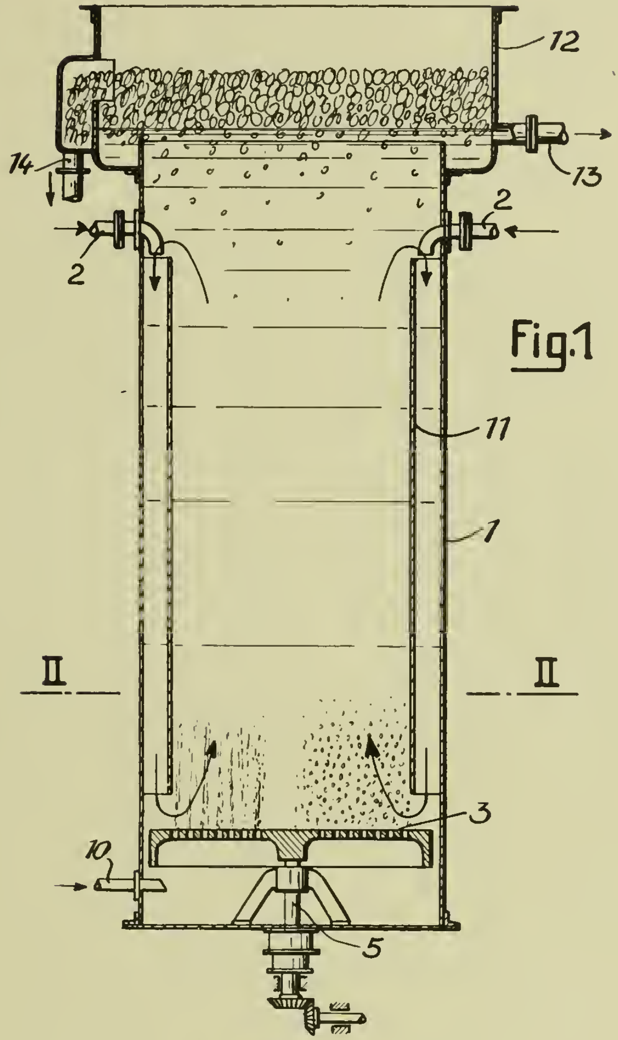
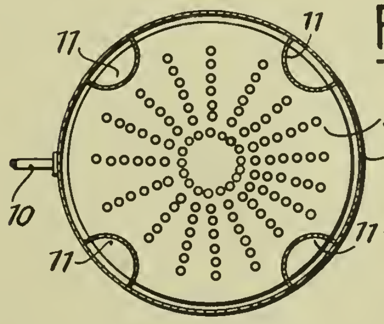


Fig.1

Fig.2



Inventor:
Heinrich Koppers
by Henry Love Clarke
Attorney.

Published May 25, 1943

Serial No. 363,566

ALIEN PROPERTY CUSTODIAN

TOTALIZERS

Robert Anschütz, Zella-Mehlis, Germany; vested in the Alien Property Custodian

Application filed October 30, 1940

This application is a continuation of my application Ser. No. 111,726, filed 11, 19, 1936, and relates to a totalizer, more particularly for typewriter calculating machines the latter having a total taking mechanism.

Various forms of such totalizers are already known as, for instance, those disclosed in patents to Briken Nr. 1,266,660 of May 21, 1918, and to Wahl Nr. 1,270,471 of June 25, 1918.

For instance, it has been proposed to use the usual tens transmitting gear as a stop for the "zero-setting" or "zero-shifting" by locking the driving wheel of the totalizer which is located of the next higher place or denomination of the totalizer with respect to the numeral roller which is to be set or brought to zero. The numeral roller which is to be brought to zero in this case is limited in its rotation by the tens shift cam which acts on the next higher place. In view of the fact that the tens shift cams are relatively small and have a form which is not suitable for the relatively heavy stresses occurring in the total taking, it has been further proposed to provide a particular zero-stop. Although the shape of the zero-stop could thus the better adapted to be requirements, it was not possible to make the zero-stop very strong and durable and to arrange the counter-stop in a convenient manner, as the zero-stop was arranged at a toothed wheel which was located between the main driving wheel and the number roller.

These disadvantages are eliminated according to the invention by the provision of an additional group of toothed wheels which is connected, preferably in parallel arrangement, with the train of toothed wheels which is arranged between the main driving wheel and the numeral roller.

This offers the advantage that the zero-stop at the wheels of this group of toothed wheels can be made very strong and sufficiently wide, and the wheels of this group of wheels can be so mounted that they co-act with the counter-stop in a suitable manner.

Furthermore this arrangement offers the advantage that the wheels of the additional group of wheels may be adapted for carrying the teeth for the known clear sign feeling member at the same time. The small extension or projection of the totalizer casing which is necessary in order to accommodate the additional group of wheels is advantageously enlarged so as to render it possible to utilize the same for supporting and enclosing the clear sign feeling member and the control cam for adjusting the type of calculating and writing.

In the drawings, one form of construction of the invention is illustrated by way of example.

Fig. 1 shows a left-hand side elevation of a "Mercedes Addelektra" typewriter calculating machine, provided with the novel device according to the invention.

Fig. 2 shows a fragmentary perspective view, viewed from the left-hand front side of the machine, of the device according to the invention, including the mechanism for the drive.

Fig. 3 shows, in a perspective view, viewed from the left-hand front side of the machine, the supporting member for the zero-shifting and aligning tooth, the parts being separated from each other for the sake of better illustration.

Fig. 4 represents a side elevation of a totalizer, the left-hand side wall being removed in order to show the gear system of the totalizer.

Fig. 5 shows, in a perspective view, the left-hand group of wheels of the totalizer.

General description

On the machine frame **1** (Figure 1) the carriage **2** with its platen **3** is displaceably mounted on the running rails **4** and **5**. The totalizers **6** (Figure 1) are mounted so as to be readily attachable and detachable on a rail **7** fixed to the carriage frame **8**. The carriage **2** is continuously acted on by a spring-operated draw band (not shown) from right to left. By means of an escapement mechanism described in the Patent Nr. 2,046,524, the carriage **2** is moved on each key-stroke towards the left one step at a time.

On the front side of the machine, a row of number-keys **9** (Figure 1) is arranged. By means of these number keys **9**, values are typed upon the platen **3**, but not inserted into the totalizers **6**. The character keys **10**, which are arranged underneath the number keys **9** in the keyboard serve for the writing of clear text. The space key **11** is located in front of the character keys **10**. By means of this space key **11**, when depressed, the paper carriage **2** may be selectively moved one or more steps to the left.

Underneath the usual keyboard, the tabulator keys **12** (Figure 1) are arranged in the supporting frame **13**. If one of the tabulating keys **12** is depressed, in a manner described in detail in Patent 2,046,524, one of the column totalizers **6** is brought with a certain denomination into the desired calculating position, whereby the carriage **2** is released. Underneath the tabulator keys **12**, the calculating keys **14** are arranged

in the supporting frame 13, by depression of which values are transmitted into the totalizers 6, whereby the corresponding values are simultaneously typed upon the platen 3.

Besides the calculating keys 14, and the tabulator keys 12 a key 15 (Figure 1 and 2) provided with the Mark "TV" is arranged on the left hand side in the supporting frame 13. This key 15 serves for total taking from the totalizers 6.

On the right hand side of the paper carriage 2, a carriage release lever 16 (Figure 1) is arranged. By depression of this release key 16, the carriage 2 is released as described in the patent Nr. 2,046,524.

On the right hand side of the machine 1 the motor 17 (Figure 1) is arranged.

Brief description of several controlling means

The parts described in the following do not form a part of the invention, but for a better understanding of the present invention, it seems advisable to briefly refer thereto. The totalizer 6 is provided with a control cam 170 swingable round a shaft 171 and a control plate 172. If the control cam 170 coacts with the angle lever during the total taking process, the calculating mechanism is adjusted for subtraction and the case shifting of the platen is effected whereby the values written down in inclined numbers and if the control plate 172 coacts with the lever 174 the kind of calculation is changed over from addition to subtraction.

General description of the details of the mechanism concerning the invention

The member 46 which is shown in figs. 1 and 2 is arranged at the arm 47 of the three-armed lever 44, which arm 47 is bent off as shown in fig. 1 and 2 and fixed thereto by means of screws 115. The upwardly extending end of the member 46, is capable of acting upon a roller 117, by means of its inclined face 116 (fig. 2), in the manner which will be described under the heading "Operation of the device according to the invention". The roller 117 is rotatably mounted in any suitable manner on a zero-setting and aligning tooth 48 which forms a part of the invention. The zero-setting and aligning tooth 48 is held in its normal position under the action of the spring 121, which is held at one end by a bolt 118 (which is fixedly mounted on the zero-shifting and aligning tooth 48) and with its other end acts upon the bolt 120 which is fixedly mounted on the front wall 119 of the calculating mechanism, (figs. 1 and 2). This normal position of the spring 121 is determined by the contact of the lower edge 122 (fig. 2) of the zero-setting and aligning tooth 48 with the face 123 (fig. 3) of the portion 124 of the guiding member 125. The guiding member 125 (fig. 3) consists of two parts 124 and 126, the part 124 is fixed to the front wall 119 (fig. 1) of the calculating mechanism in any suitable manner by means of screws (not shown), while the part 126 is fixed to the part 124 by means of screws 127 (fig. 3). The zero setting and aligning tooth 48 which is guided in the recess 128 of the part 124 of the guiding member 125 and held thereto by the part 126 of the guiding member 125, is capable of coacting with the left intermediate wheel 130 (fig. 1, 4 and 5) of the totalizer 6, by means of its tooth 129. The part 126 of the guiding member 125 is provided with a recess 131 in such manner that the aligning tooth 48 after removal of the spring-operated bolt 118 can be lifted out in upward direction, notwithstanding the fact that the roller 117 is arranged on the aligning tooth 48.

Rotatably mounted on two shafts 132 and 133 (fig. 1, 4 and 5) which are supported in the two side walls of the totalizer 6 are the number rollers 134 and 87 and the wheels 152 and 137 which are rigidly connected with the rollers 134 and 87, respectively, and the comma rollers (not shown). The number rollers 134 and 87 engage with the transmitting wheels 135 which are rotatably mounted on a shaft 136 which in turn is rigidly supported in the two side walls. Furthermore the toothed wheels 137 which are rigidly connected with the number rollers 87 mesh with intermediate wheels 139 which are rotatably mounted on a shaft 138 which is supported in the two side walls of the totalizer 6. The wheels 139 in turn mesh with driving wheels 96 which are rotatably mounted on the shaft 140, which is rigidly supported in the two side walls of the totalizer 6. Rotatably mounted on a further shaft 141 which is supported in the two side walls, are the wheels 130 which likewise mesh with the driving wheels 96. The wheels 130 are shown in fig. 5, it will be seen that two teeth 142 and 143 are provided having a width equal to the total width of the disk 130*a* and the toothed wheel 130*b* (fig. 5). The wheels 130 are adapted to co-act with the teeth 129 of the zero-setting and aligning tooth 48. Moreover two further teeth 144 and 145 (fig. 5) are provided which have a smaller width and are adapted for coacting with the feeling member 146 (figs. 1 and 4) of the clear sign printing device which coacts with parts described and illustrated in British patent Nr. 414,248. Mounted on the front wall 119 of the calculating mechanism 147, by means of screws 148, is a support 149 which is shaped as shown in fig. 4 and at its upwardly bent end bears a rotatably mounted roller 150 which co-acts with the part 151 (figs. 1 and 4) of the totalizer 6 in the manner set forth hereafter under the heading "Operation of the device according to the invention".

Operation of the device according to the invention

At first, it may be assumed that values have been introduced into the totalizers 6 in a known manner. Now, if the total or the subtotal is to be taken, the respective totalizer 6 is brought into its working position by means of the space key 11 (Fig. 1) or one of the tabulator keys 12, whereby the left-hand driving wheel 96 of the column totalizer 6 is brought into engagement with the main driving wheel 63 and the left-hand driving wheel 130 of the column totalizer 6 comes into a position opposite to the gap 153 (Fig. 5) of the zero-setting and aligning tooth 48. When the totalizer 6 is moved into its working position, the main driving wheels 63 are aligned by the portion 154 (Fig. 5) of the aligning tooth 48. Now, if the corresponding totalizer 6 from which the total or subtotal is to be taken, is brought into its working position, the key 15 which is marked with "TV" is depressed. When depressing this key 15 and swinging the lever 24, the latter by means of its arm 155 (Figs. 1 and 2) acts upon the lever 39 and swings the same in an anti-clockwise direction round the screw 156. The slide 40 participates in this movement and is displaced in the direction of the arrow 41. The lever 44 (Figs. 1 and 2) is also acted upon thereby and swung round the

screw 45 in an anti-clockwise direction, thus acting with the inclined face 116 of the part 46 which is fastened at the lever 44, upon the roller 117 which is fastened at the zero-setting and aligning tooth 48. The aligning tooth 48 is thereby upwardly moved in the direction of the arrow 157, against the action of the spring 121. As soon as the key 15 has reached its depressed position, the face 158 (Fig. 2) of the part 46 contacts with the roller 117 of the aligning tooth 48. When depressing the key 15 the actuating mechanism is released in the manner described in patent application of Kämmel, Ser. Nr. 287,672, and the main driving wheel 63 (Fig. 4) is driven in an anti-clockwise direction. The left-hand driving wheel 96 of the column totalizer 6 is thereby rotated in a clockwise direction and the left-hand wheel 130 of the column totalizer 6 is rotated in an anti-clockwise direction, i. e. for instance by five units, if the value "5" has been introduced into the left-hand numeral roller of the totalizer 6, whereby the tooth 143 of the wheel 130 strikes against the aligning tooth 129, while the toothed rim of the same passes through the slot 153 (Fig. 5) of the aligning tooth 48. At the same time, by the rotation of the driving wheel 96 in a clock-wise direction, the numeral roller 87 is set from "5" to "0", by means of the intermediate wheels 139 and 137, whereby the value which is in the left numeral roller 87 is cleared or brought out of the totalizer 6. This value then at the same time is printed on the form or paper by means of the mechanism described and illustrated in application, Serial Number 287,672. In the same manner the values which are in the remaining numeral wheels 87 are written out. Now, after the last place or denomination of the totalizer 6 has been cleared, the key 15 which up to this instant has been held depressed automatically, as described in application Serial Number 287,668, is released, whereby all of the mechanisms thereby actuated return to the original position, so that no further calculating operation can occur.

In consequence of the arrangement of the gear wheels 130 in the totalizer 6 it is possible to combine the usual clear sign feeling member 146 (Figs. 1 and 4) also with the group of wheels 130. The feeling member 146 which is rotatably mounted on the shaft 160 then feels off either of the two short tooth 144 and 145 of the gear wheels 130.

In order to guide the totalizers 6 in a safe and reliable manner when it is introduced into the calculating place or denomination, the arrangement is provided as follows:

When any of the totalizer 6 is introduced into the left-hand calculating place or denomination, the roller 150 (Figs. 1 and 4) of the support 149 contacts with the face 161 of the part 151 which is fastened at the totalizer 6 and thus prevents the totalizer 6 from rising. The part 151 is fastened in the two side walls of the totalizer 6 in a suitable way and, at the same time, forms the front wall of the totalizer 6.

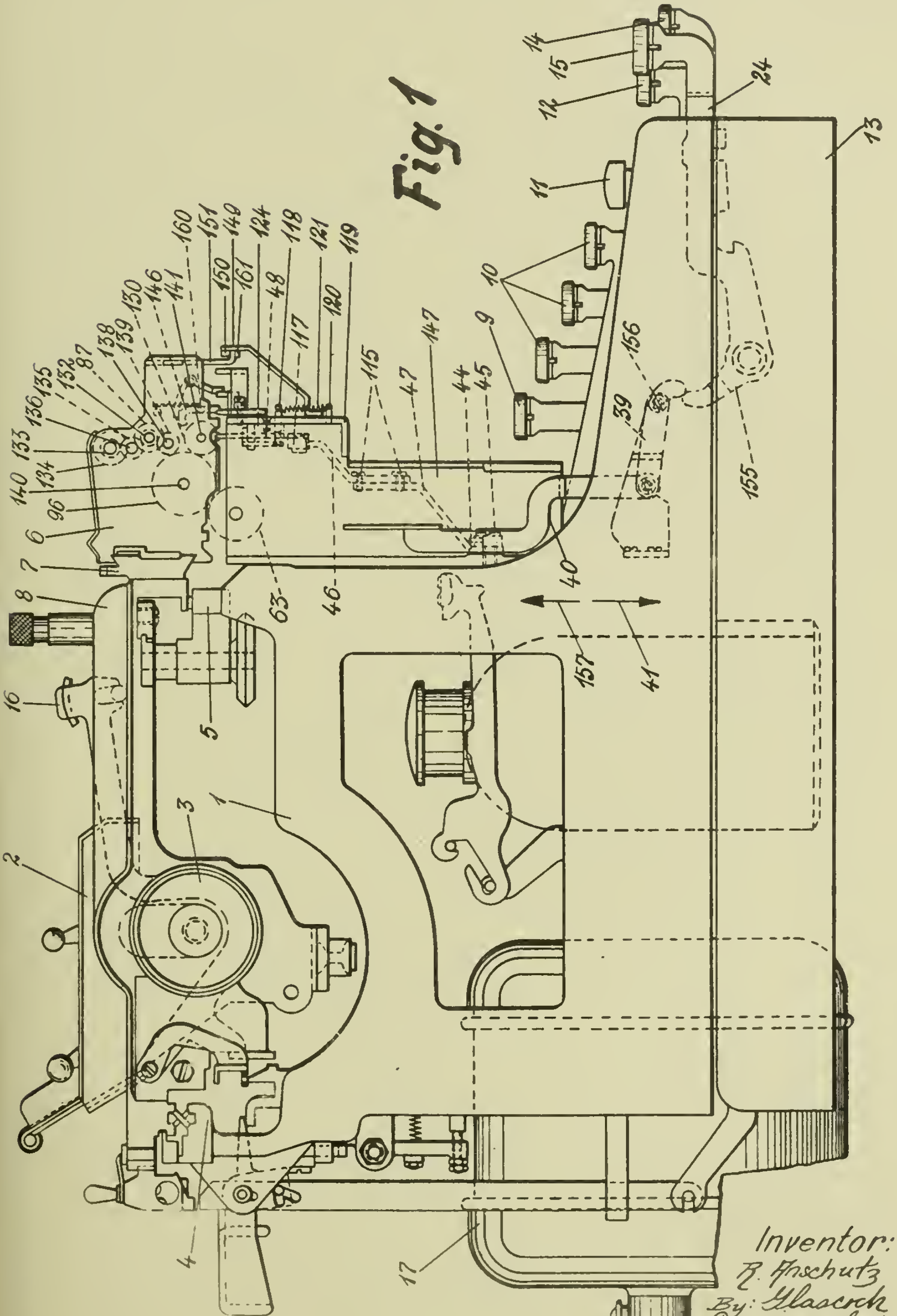
This guiding device is known per se, from patent to Kurowski Number 1,876,696 of Sept. 13, 1932, however, it has not been suggested before to use it in connection with the total taking device and this novel combination adds to the faultless and reliable clearing of the totalizers.

ROBERT ANSCHÜTZ.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. ANSCHÜTZ
TOTALIZERS
Original Filed Nov. 19, 1936

Serial No.
363,566
4 Sheets-Sheet 1

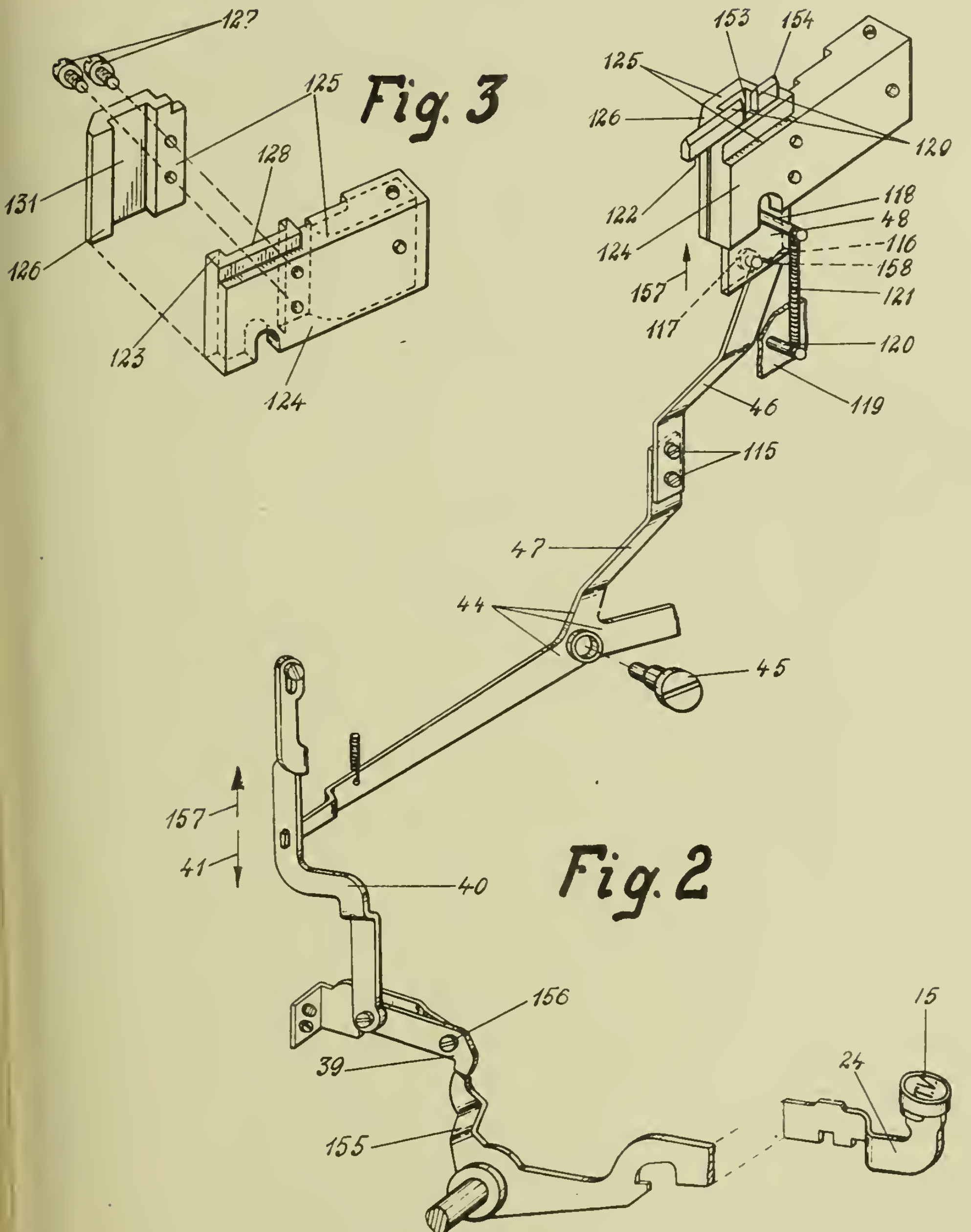


Inventor:
R. Anschutz
By: Glascock
Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. ANSCHÜTZ
TOTALIZERS
Original Filed Nov. 19, 1936

Serial No.
363,566
4 Sheets-Sheet 2



Inventor:
R. Anschutz
By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. ANSCHÜTZ
TOTALIZERS
Original Filed Nov. 19, 1936

Serial No.
363,566
4 Sheets–Sheet 3

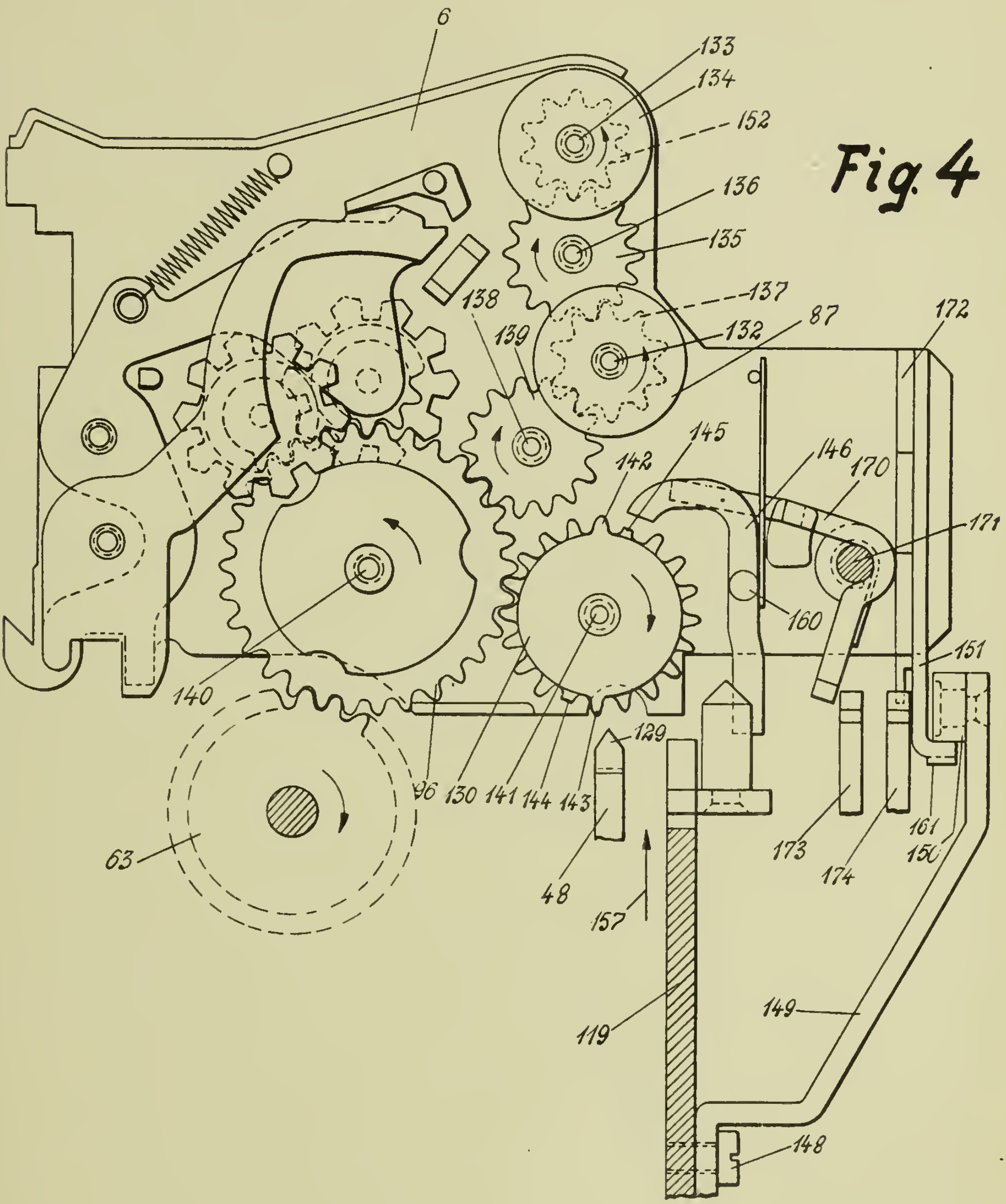


Fig. 4

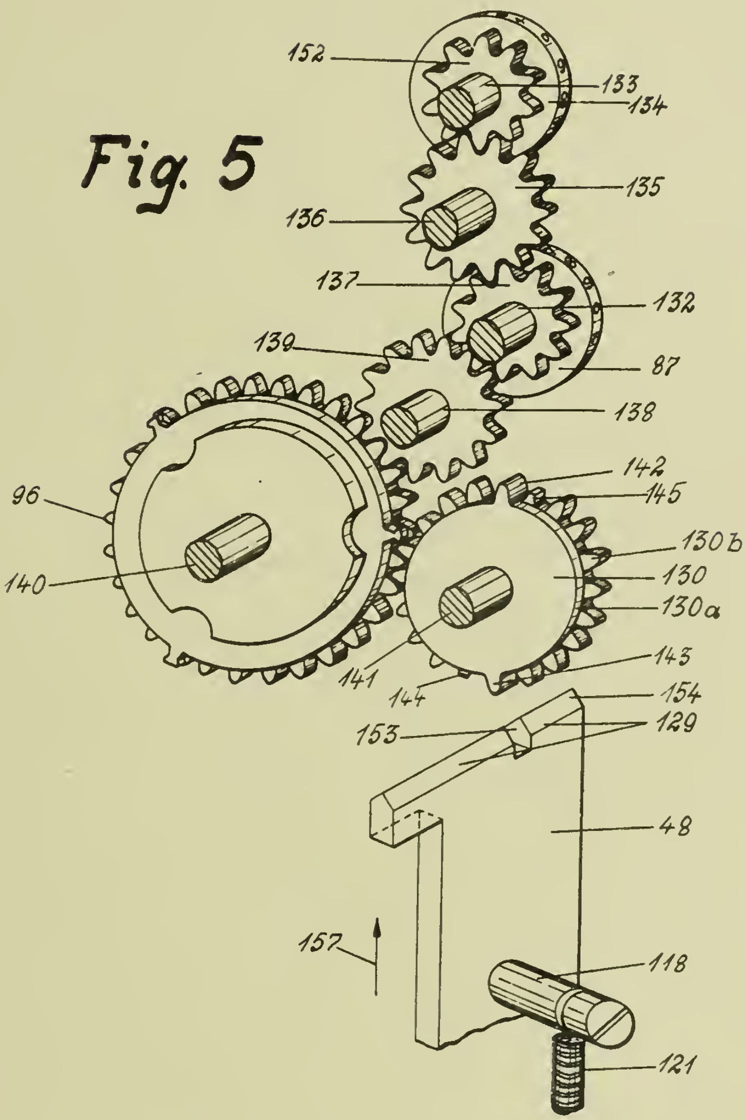
Inventor:
R. Anschutz
By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. ANSCHÜTZ
TOTALIZERS
Original Filed Nov. 19, 1936

Serial No. 363,566
4 Sheets-Sheet 4

Fig. 5



Inventor:
R. Anschütz
By: Glascock Downing & Seebold
Attys.

Published May 25, 1943 Serial No. 363,862

ALIEN PROPERTY CUSTODIAN

ARRANGEMENT FOR THE AUTOMATIC TUNING OF A TRANSMITTER ANTENNA

Erich Dölle and Hermann Stier, Berlin, Germany; vested in the Alien Property Custodian

Application filed November 1, 1940

For the automatic tuning of an electric structure capable of producing oscillations such as, for instance, a receiver an entire series of arrangements are known. The majority of these arrangements utilize as the criterion for the attained resonance the phase equality of current and voltage in the respective resonance circuit, since for even a slight detuning there exists a considerable phase difference between current and voltage. This type of control of the automatic tuning is termed "phase jump" method.

Arrangements are also known in which the resonance curve is scanned and the tuning is varied until the amplitude of the current, or of the voltage has reached its maximum. Since the latter arrangements are more complicated as to structure and furnish at their best no better setting possibilities and usually a less accurate setting due to the flat slope of the resonance curve in the immediate vicinity of the maximum, arrangements are usually employed which operate in accordance with the "phase jump" method.

In accordance with the present invention in such an arrangement for the automatic tuning of a transmitter antenna, to the frequency of the coupled transmitter there serves as criterion for the exact tuning the maximum of the antenna current, or of the antenna voltage. More especially, there is provided in a manner known as such a tuning variation means which oscillates periodically only within a narrow range and which is responsive to only difference of the current values, or voltage values which disappear at resonance, and which values exist in the border points of the oscillatory tuning, for the purpose of controlling a constant variation of the tuning. A further method may also be employed in which there serves for the control of the remaining tuning variation a differential quotient with respect to time which disappears at resonance. The quotient taken may be based on the effective antenna power of the detected antenna current or of the detected antenna voltage. Each of these values vary with the tuning.

The present invention will be more clearly understood by reference to the following detailed description which is accompanied by a drawing in which Figures 1 and 3 are curves useful in explaining the principle of the invention as applied to the antenna circuit of Figure 2, while Figure 4 illustrates an application of one modification of the invention to the circuit of Figure 2, Figure 5 shows further curves illustrative of the operation of the invention and Figures 6 and 7 show further modifications of the invention.

The advantage of the present invention can be recognized from the following considerations: In an ordinary oscillatory circuit the maximum of the amplitude-resonance curve coincides with the passing through zero of the phase resonance curve as shown in Figure 1. However, a different condition exists in the case of a transmitter antenna having a circuit as shown, for instance, in Figure 2. Herein S is the final amplification circuit of a transmitter, said circuit being tuned by means of the variable inductance L. A part C_1 of the capacity of the circuit is connected through the shielded transmission line or cable K across the antenna transformer T which is coupled to the antenna A. The latter can be tuned by means of the inductance L_A.

When plotting for such an arrangement the phase difference between the antenna current and antenna voltage on the one hand and the amplitude of the antenna current on the other hand, as a function of the tuning of the antenna circuit comprising substantially the antenna capacity and L_A, the resonance curves according to Figure 3 will be obtained. According to this figure the passing through zero of the phase curve and the maximum of the amplitude curve do not coincide with each other. This is explained by the fact when the impedance of the antenna is purely ohmic the condenser C_1 is shorted to a greater or lesser degree and the output circuit of the transmitter is so detuned that the latter and, therefore, also, the antenna cannot conduct the maximum current possible. The fact is rather that the location of the strongest antenna current corresponds with an inductive state of the antenna.

Consequently, such arrangements which bring about an automatic tuning to the zero phase directly at the antenna offer in use, in general, but a very poor degree of efficiency. Such arrangements could be utilized with a more favorable degree of efficiency only if according to a proposal already made, the arrangement is so adapted by the insertion of a coil tuned with the transmitter in the lead from the condenser C_1 to the cable K that the influence of the detuning of the output circuit of the transmitter caused by the ohmic state of the antenna is eliminated or compensated for.

The present invention, however, renders possible a correct automatic tuning of the antenna arrangement in each case, irrespective as to whether or not the transmitter is provided with the said compensation device. The antenna device hence can be connected to the automatic tuning arrangement at any desired transmitter. An example of construction according to the present invention is shown in Figure 4.

The transmitter antenna A is connected to ground through a series circuit comprising the tuning coil L_a, a fixed additional coil L, the primary coil of a current converter T and the terminals x, y to which the alternating voltage is applied which comes from the transmitter.

The vibrating switch P has an exciter coil E which is placed in series to the voltage source Q, a switch S and the exciter contact p_1. A further contact p_2 is placed in parallel to the coil L and a third reversing contact p_3 of the vibrating converter is so connected that the moved contact pole lies in series with the secondary coil of the transformer T and a detector G, while the two fixed contact poles are connected to the coil ends of the differential relay D. The coil center is grounded as is the end of the secondary coil of the transformer T which is not connected to the detector G. The switching contact *d* of the differential relay D energizes the terminals of the reversible motor M in accordance with the sense of the excitation of the winding by either the voltage of the direct voltage source Q_1 or the voltage of the source Q_2 with opposite polarity. This motor is mechanically coupled in any suitable manner with the tuning device of the coil L_a.

As soon as the vibrating switch P is actuated by closing the contact S_1 the impedance L in the antenna circuit is periodically short-circuited by the contact p_2. The switch p_3 operating simultaneously with p_2 supplies the coils of the differential relay D which act against each other with current pulses which are proportional to the antenna currents which flow in the antenna circuit in the conditions of open or short-circuit of self inductance L. Depending on whether the operation takes place on the left side, or right side of the resonance curve, the difference current in the coil of the relay has a different direction so that the contact *d* engages different fixed contacts. The direction of rotation of the motor M thus is always so determined that the variation of the tuning impedance L_a takes place in the direction towards resonance. When the resonance point is reached, the vibratory tuning takes place symmetrically with respect to the resonance position so that the current pulses in the two coils of the relay are identical in value. The armature of the relay hence, assumes the neutral center position and disconnects the motor M.

Figure 6 shows an example of construction according to the present invention in which the differential quotient in respect to time, which disappears at resonance, of the antenna power varied with the tuning, serves for controlling the variation of the tuning. Figure 5 shows a resonance curve *i* and its differential quotient *i'* in respect to time for a transit of the tuning operation, i. e. the figure shows the steepness of the resonance curve.

In the circuit according to Figure 6 by pressing down the key B the circuit of the motor M is closed across the contacts *a* and *p*. An impedance of the antenna circuit, for instance, the variable self inductance L_a, is continuously varied by the motor in a certain direction. If the current starts flowing in the antenna circuit in the proximity of the resonance, a current is obtained through the condenser C and through the resistance R which current is almost proportional to the differential quotient *i'* in regard to time, of the resonance curve of Figure 5 if care is taken that the apparent resistance of the condenser C is sufficiently high against the resistance R.

The amplifier tube V is blocked in the state of rest and thus no plate current flows. Owing to the potential drop through the resistance R the grid biasing potential will be less negative so that a plate current pulse will be given across the coil of the polarized relay PR. The contact *p* will thus next be closed.

The sensitivity of the further relay F must be so regulated that it only begins to operate and opens its contact *f* after *p* is closed. The control of the motor M thus takes place solely across the contact *p*. In the state of resonance proper the current passes through zero. PR has then no current thus severing the circuit of the motor. The tuning of the transmitter antenna is thus reached.

Furthermore, it is advisable to utilize in conjunction with the circuit according to the present invention, additional arrangements which in the case of a wider detuning permit of first a rough automatic tuning in the shortest direction because the described devices normally operate reliably only if the initial detuning is not too excessive. An example of construction for such an arrangement is shown in Figure 7.

Now, when applying a voltage to the series resonant circuit comprising the capacity of the transmitter antenna, the self inductance L_a, the antenna tuning coil whereby the said voltage (transmitter potential) has a frequency that is lower than the resonance frequency of the circuit, the voltage at the condenser K' is higher than that at the self inductance L_a. The current at the coil I of the different relay D hence predominates and moves the contact *d* upwards, for instance. If the frequency is higher than the circuit frequency, the voltage on across L_a will be higher so that therefore the current at the coil II of the differential relay D predominates. The contact *d* therefore moves down. The arrangement can be so adapted that across the contact *d* a motor will be controlled as in Figure 4 which through the variation of L_a so changes the tuning of the transmitter circuit that the latter passes to the resonance point on the shortest way.

In the case of resonance the two potentials at K' and L_a would have the same value and opposite senses. The contact *d* would thus assume the central position and would disconnect the drive motor.

In all practical cases the resonant voltages at K' and at L_a have such high values that the detectors G_1 and G_2 would be destroyed. These detectors must necessarily be very sensitive since the potentials serving for the control of D are, outside the resonance point, higher than at the resonance point, by two to three orders of magnitude. For the protection of these detectors glow discharge paths Gl_1 and Gl_2 are employed which short circuit the detector as soon as the voltage at the detector exceeds the potential of the glow discharge. Hence, the tuning of the circuit consisting of K' and L_a can only be brought near the resonance point by the use of the arrangements according to Figure 7. The accurate setting must then be done by means of another arrangement such as, for instance, that shown in Figure 4.

ERICH DÖLLE.
HERMANN STIER.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

E. DÓLLE ET AL
ARRANGEMENT FOR THE AUTOMATIC TUNING
OF A TRANSMITTER ANTENNA
Filed Nov. 1, 1940

Serial No.
363,862

2 Sheets-Sheet 1

Fig. 1

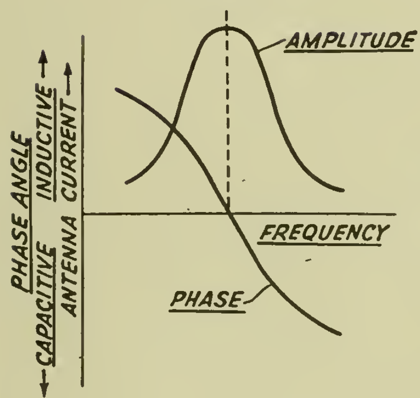


Fig. 3

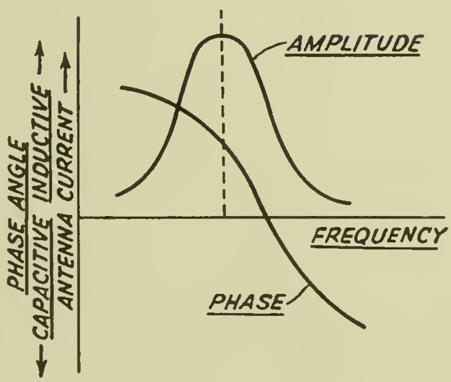


Fig. 2

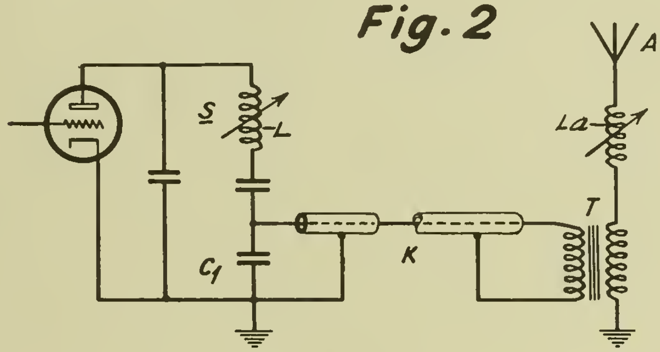
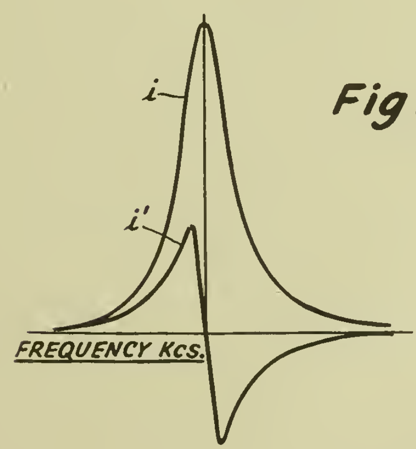


Fig. 5



INVENTOR
ERICH DÖLLE
HERMANN STIER
BY H. S. Grover
ATTORNEY

PUBLISHED

MAY 25, 1943.

BY A. P. C.

E. DÖLLE ET AL

ARRANGEMENT FOR THE AUTOMATIC TUNING OF A TRANSMITTER ANTENNA

Filed Nov. 1, 1940

Serial No. 363,862

2 Sheets-Sheet 2

Fig. 4

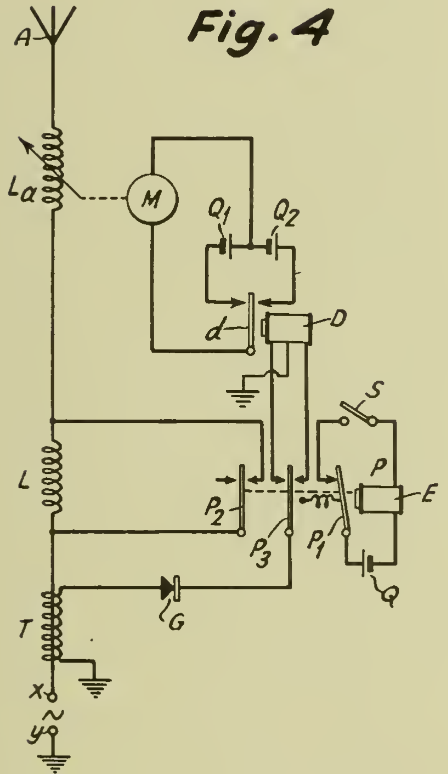


Fig. 6

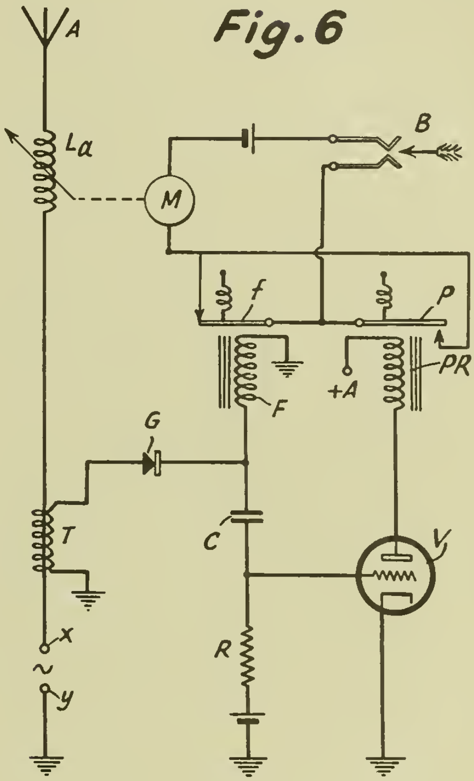
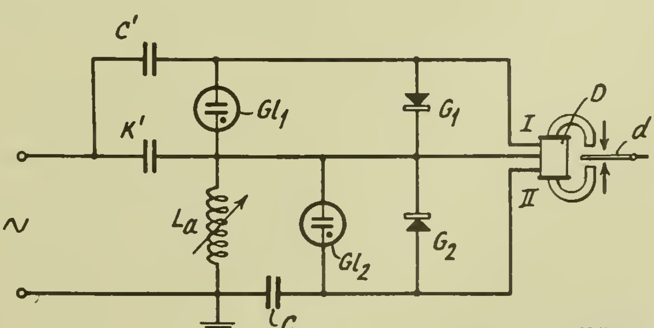


Fig. 7



INVENTOR
ERICH DÖLLE
HERMANN STIER
BY H. S. Grover
ATTORNEY

Published May 25, 1943 Serial No. 369,882

ALIEN PROPERTY CUSTODIAN

PROCESS OF MANUFACTURING A BUILT-UP PERMANENT MAGNET

Takeshi Iseki, Toyonaka, Japan; vested in the Alien Property Custodian

Application filed December 12, 1940

This invention relates to improvements in the process of manufacturing a built-up permanent magnet which consists of a piece of magnet and two pieces of soft iron attached to said magnet with one end of each soft iron piece acting as the magnetic pole, and more particularly to the method of building up a permanent magnet, wherein a magnet piece and two soft iron pieces are put together by an intervention of thin non-magnetic metallic plates which are attached to both sides of the magnet and soft iron pieces by electrical spot-welding method, and the tight and close contact of the magnet and soft iron pieces is made by the contraction of the heat-expanded metallic plates.

Hitherto, the elements of the built-up permanent magnet has been put together by means of screws, solder or riveting, but these methods involve such difficulties as drilling and tapping in the soft iron and non-magnetic metallic plates leaving unavoidable and allowable clearance between the contacting surfaces of the magnet and soft iron pieces, thereby causing a considerable magnetic loss. Moreover, these processes are expensive and clumsy because it is not an easy task to get a proper fit of the magnet into the space formed by the soft iron pieces and the covering metallic plates.

The present invention successfully does away with these difficulties, and perfect contact between the magnet and soft iron pieces can be readily and economically attained.

Referring to the attached drawing, Figs. 1 and 2 show a plan and a sectional elevation along the line II—II of Fig. 1, respectively, of a built-up permanent magnet made according to the present invention, wherein two soft iron pieces B with one end of each as the pole are put together with the permanent magnet piece A by an intervention of two pieces of thin non-magnetic metallic plates C placed so as to cover both sides of the magnet and the soft iron pieces.

To build up the permanent magnet according to this invention, the magnet piece A and the soft iron pieces B are tightly put together, and non-magnetic metallic plates C are placed on both sides of the magnet and the soft iron pieces so as to bridge them over. Then the non-magnetic plates alone are heated for a few seconds, and the prearranged elements are electrically spot-welded at the points indicated in the drawing by small dotted circles D. When the non-magnetic metallic plates are cooled, the magnet and the soft iron pieces come to very tight and close contact with each other due to the contraction of the metallic plates. It is necessary that the contacting surfaces of the magnet and the soft iron pieces previously be finely finished to insure close contact.

Fig. 3 is a plan view of another form of the built-up permanent magnet the elements of which are prearranged in a device for practising the process of this invention. Fig. 4 is a sectional elevation of the device and the magnet along the line IV—IV of Fig. 3.

In this example, soft iron pieces B are placed on both ends of the permanent magnet A so that the permanent magnet is held between the soft iron pieces.

E is a frame of the device made of a metallic circular ring. G are set screws radially provided on the frame of the device the inner ends of the screws being extended into the inside of the frame.

A spring arm H is pivoted on each surface of the frame. This spring arm can be swang by means of a knob I, and when it is swang outwardly its free end rides on the surface of the frame.

To practise this invention, the elements, that is, permanent magnet A, soft iron pieces B and covering plates C are inserted in the frame of the device as illustrated in the Figures 3 and 4, and the permanent magnet and the soft iron pieces are put together tightly by means of the set screws and the non-magnetic metallic plates C are properly held on the surface of the magnet and soft iron pieces in such a way as to bridge over the contacting lines of the pieces by means of the spring arm H.

When the necessary prearrangements are completed, one end of the covering plates on both sides is spot-welded to one of the soft iron pieces at the points marked D'. Then the covering plates are heated by a gas burner, for example, for a few seconds, and the other end of the covering plates while still hot are spot-welded to the other soft iron piece at the points marked D.

In the illustrated instance in Figs. 3 and 4 the magnet A and the non-magnetic metallic plates C are not welded together, because the soft iron pieces hold the magnet so tightly due to the contraction of the plates that the welding becomes unnecessary, but the direct welding to the magnet may be used wherever such method is deemed desirable, depending upon the sizes and shapes of the built-up magnet.

The built-up permanent magnet manufactured by this new process contains no screws, neither is it riveted nor soldered. This is a new product as a built-up permanent magnet per se.

TAKESHI ISEKI.

[illegible]

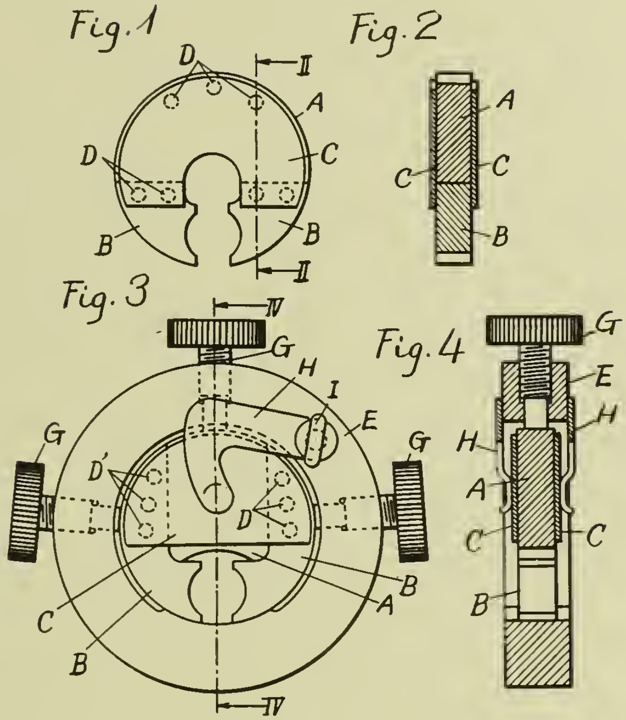
PUBLISHED

MAY 25, 1943.

BY A. P. C.

T. ISEKI
PROCESS OF MANUFACTURING A BUILT-UP
PERMANENT MAGNET
Filed Dec. 12, 1940

Serial No.
369,882



Inventor:
Takeshi Iseki
By E. F. Wenderoth
Atty

Published May 25, 1943 Serial No. 364,319

ALIEN PROPERTY CUSTODIAN

RAIL FASTENING

Valentin Retterath, Iversheim, near Munstereifel, Germany; vested in the Alien Property Custodian

Application filed November 4, 1940

This invention relates to a rail fastening.

Among the numerous types of rail fastenings known preference deserve those that avoid the use of screws and hold down the rail base by means of a locking member guided in a rib of an iron tie or a locking plate transversely to the longitudinal direction of the rail, as indicated for instance in German Patent No. 617,882. Rail fastenings of this class are of exceedingly simple construction, permit easy and rapid installation of the rails and nevertheless insure sufficient protection against unauthorized detachment.

In contradistinction to these known rail fastenings, however, in which the usualy slotted locking member is held in the guide rib by a key, etc. the invention proposes to provide a locking member acting as a tension lever.

The invention attains its object by providing the locking member resting with one end on the rail base on its other end with means for pressing off this end from the tie or other support, so that the locking member acts as a double-armed tension lever whose fulcrum is located in the guide rib. In this way the rail base is fixed with increased security to its bed, even if the locking member is not placed in accurate position. This arrangement facilitates, moreover, the installation of the rails and increases both the holding effect and the security of the construction, since the locking member is not weakened by slots, etc. The means for pressing off one end of the locking member may be of various types, and several possibilities are described below with reference to the accompanying drawing, in which

Figure 1 is an elevation, partly in longitudinal section, of a rail fastening according to the invention;

Fig. 2, a vertical cross section on the line II—II of Fig. 1;

Figs. 3 to 5 show a modification, Fig. 3 being an elevation, partly in longitudinal section; Fig. 4, a vertical cross section on the line IV—IV, of Fig. 3, on an enlarged scale; and Fig. 5, a top view thereof;

Figs. 6 to 8 show another modification, Fig. 6 being an elevation, partly in longitudinal section; Fig. 7, a vertical cross section on the line VII—VII, of Fig. 6, on an enlarged scale; and Fig. 8, a detail view.

Referring to Figs. 1 and 2, the rail 1 shown in cross section rests on a tie 2 provided with a guide support 3 having a dovetailed recess for the reception of a correspondingly shaped solid locking member 4. The end of the member 4 facing the rail base possesses on its underside a clearance 5 for accommodating the portion 6 of the rail base to be engaged by the locking member 4. The end of the member 4 averted from the rail base has a threaded bore for the introduction of a lifting screw 7.

Fig. 1 shows to the right the inserted but not yet forced out locking member 4 and to the left the member 4 in tensioned position. The locking member 4 is first advanced until its front end engages the rail base to a sufficient extent without paying particular attention to placing the member in an absolutely accurate position. Then the screw 7 is tightened so that its lower spherical, conical, etc. end 8 enters a recess 9 of the tie 2 and, finally, the locking member 4 is moved with the fulcrum located within range of the support 3.

After the locking member 4 acting as a double-armed lever has been fixed the screw 7 may be secured against arbitrary turning by removing for instance the square 10.

The rail base is thus securely fixed, and the end of the screw 7 having entered the recess 9 prevents longitudinal displacement of the member 4 in the guide 3.

In the construction shown in Figs. 3 to 5 the rail 1 rests again on a tie 2 provided with a guide support 3 having a dovetailed recess for the reception of a correpondingly shaped locking member 4 which engages the portion 6 of the rail base.

Forcing out or lifting is effected with the aid of a driving pin 11 which acts upon a soft metal insertion 12 arranged in a recess provided in the respective end of the member 4 and proceeding from the underside thereof. The soft metal 12 is not only forced up in the narrow annular gap formed between the pin 11 and its bore in the member 4, but caused also to spread downwardly on the underside of the member 4 so as to lift the member 4 off from its support 2.

The means for preventing longitudinal displacement of the member 4 comprise slots 13 disposed transversely to the direction of displacement in the tie 2 within range of the soft metal insertion 12, having wedgelike cross sections and being filled with the soft metal when acted upon by the pin 11.

In the construction shown in Figs. 6 to 8, 1 is the rail, 2 the tie, 3 the guide support and 4 the locking member. A driving pin 11 introduced into a bore of the member 4 serves again for lifting the respective end of the member 4 from the tie 2. The pin 11 enters a conical in-

sertion 14 made of steel, etc. disposed in a conical recess proceeding from the underside of the member 4 within range of the bore for the pin 11. The insertion 14 has radial slots 15 and, when the pin 11 is driven in, is advanced downwardly and simultaneously spread out, whereby the end of the member 4 is lifted from the tie 2 and held in lifted position.

Longitudinal displacement of the member 4 when in tensioned position is prevented by a platelike recess 16 provided in the tie 2 and engaged by the insertion 14 on being driven by the pin 11.

VALENTIN RETTERATH.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

V. RETTERATH
RAIL FASTENING
Filed Nov. 4, 1940

Serial No.
364,319

Fig. 1

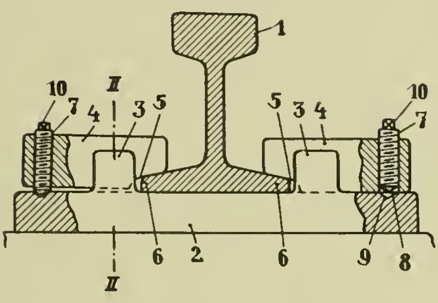


Fig. 2

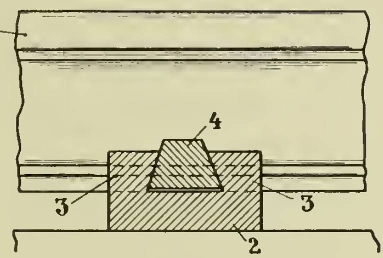


Fig. 3

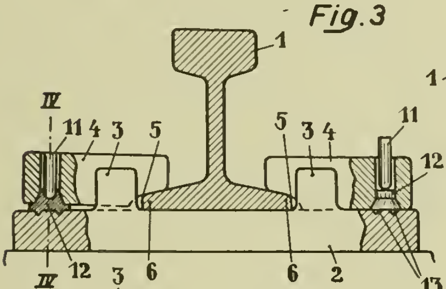


Fig. 4

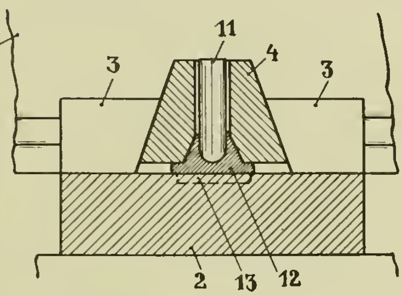


Fig. 5

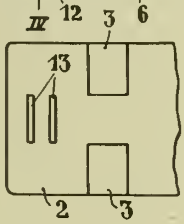


Fig. 7

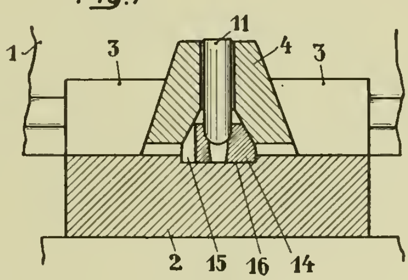
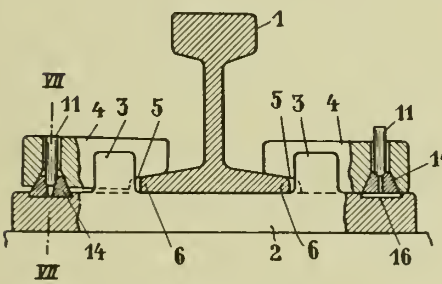


Fig. 6



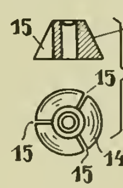


Fig. 8

Inventor:
V. Retterath
By E. F. Wenderoth
Atty

Published May 25, 1943 Serial No. 365,430

ALIEN PROPERTY CUSTODIAN

RUDDER MACHINES FOR AUTOMATIC PILOTS

Adam Kronenberger, Berlin, Germany; vested in the Alien Property Custodian

Application filed November 13, 1940

This invention relates to an automatic steering device, the servo motor of which is connected to the controlled member by means of a disengaging clutch. Especially with aircraft, it is advisable for safety reasons to incorporate within the automatic steering devices means for disengaging the rudder motor from the steering linkages. Such a coupling has the advantage that the servo motor is not dragged along when steering is done by hand and that, therefore, its friction and resistance does not have to be overcome. Until recently, steering by hand generally was accomplished by short-circuiting the double-acting pressure fluid driven steering mechanism by means of a passage leading from one side to the other side. The disengaging of a cut-off clutch, which was provided for emergencies in aircraft steering devices, was generally not used because the re-engaging of the clutch was difficult. Great care had to be exercised to couple the rudder motor so as to keep the rudder in the correct relative position. If the two parts of the coupling were connected in any accidental position, it might be possible that the rudder motor, with its transmission system, would impose a wrong position upon the rudder, or the rudder motor might reach its stop, which in most present systems with limited stroke would happen long before the rudder is fully deflected.

The present invention solves the problem of causing correct relative positioning of the two parts of the clutch at the moment of engagement and furthermore, of causing engagement automatically. According to the present invention, the correct position between the coupling parts is obtained by means of a follow-up system which creates an impulse if the parts of the coupling have a relative deviation from their neutral position, which impulse controls the servo motor in such a way that it moves its own coupling part in a direction to follow the other part of the coupling, whereby engagement automatically occurs as soon as both parts reach their neutral position.

If an electromagnetic clutch is used, a switch is preferably provided which furnishes the follow-up impulse for an electromagnetic device controlling the servo motor. This switch is connected in the manner of a voltage divider. The wrong engagement of the two clutch parts is prevented in the simplest way by a spacer which is connected to one part of the coupling and which allows engaging of the two halves only if they are in their relative neutral position.

The follow-up motion of the servo motor may be arranged in such a way that the follow-up impulses act upon the same device which now serves the purpose of transmitting the steering impulses to the rudder motor, provided the follow-up impulses are more powerful than the impulses of the steering device.

When starting the steering device, the engaging of the clutch may be accomplished automatically in a simple manner by coupling the switch for the clutch magnet with the switch device controlling the rudder motor. This may be done by a single switch.

The invention is further explained by means of the modification shown in the drawings.

Fig. 1 shows a top view of the electromagnetic clutch, partly in section, along the line **1**—**1** of Fig. 2.

Fig. 2 shows a longitudinal section through the two parts of the coupling.

Fig. 3 shows the assembly of the essential parts of an automatic steering device containing the coupling of this invention. This drawing is partly a perspective schematic.

In Fig. 3 the rudder motor **10** is designed as a crank-piston motor and is shown open in front. Oil serves as the pressure fluid and is provided by a three-wheel gear pump **13** driven by an electric motor **11** in the direction of the arrow **12**. The oil is sucked in through the pipes **14** and **15** and is pressed into the passages **16** and **17** leading to the servo motor. The control of the pressure oil is accomplished by a see-saw **18** to which two control pistons **21** and **22** are connected by means of spring wires **19** and **20**. If the see-saw **18** is inclined, one of the openings **23**, **24** is throttled, while the oil can freely escape through the other opening. In the throttle passage **16'** and **17'**, respectively, a pressure appears which acts upon the rudder motor through passages **16** or **17**, respectively, and thereby causes a corresponding motion of the power piston **25**. The motion of the piston is transmitted as rotation to the shaft **26** by means of a crank (not shown).

As described in the previous application A 90124 XI/62 *b*, the oil pump **13** and the drive motor **11** may be built into an integral assembly with the see-saw **18** and the rudder motor **10**.

The see-saw **18** is controlled by a rotary magnet **27**, the armature **28** of which is connected to the see-saw by means of a link **29**. The actual automatic steering impulses are transmitted to the rotary magnet from an electrical pick-off or transmitter, of known design, on the master instrument **30**, such as a directional gyroscope, through the winding **31**. As soon as the aircraft deviates from the desired attitude, the trans-

mitter 30 sends current of correct direction through the coil 31, whereby turning of the armature 28 is caused, which in turn inclines the see-saw 18 and starts the rudder motor. The motion of the shaft 26 then is transferred to the rudder linkage 32′ by means of a lever 32.

The lever 32 is free to turn around the shaft 26 as long as it is not in engagement with the part 33 of the coupling. The part 33 may be shifted lengthwise on the splines 26′ of the shaft 26 and may be engaged with another clutch part 34. The part 34 is rigidly connected to the lever 32 and with the same is pressed onto a bushing 35 which in turn is pivoted on the shaft 26.

In Fig. 3 the two parts 33 and 34 of the clutch are engaged.

Fig. 2 shows the same parts disengaged.

Within the part 34 of the coupling, a number of electromagnets 36 are mounted, one of which is shown in section in Fig. 2. The two parts 33 and 34 of the coupling are made of soft iron and have teeth on their opposing engaging surfaces.

If a switch 37 in Fig. 3 is closed, a battery 38 is connected by means of leads 39 and 40 to the electromagnets 36. These magnets now attract part 33 of the coupling toward the part 34. The two parts of the clutch can only engage each other when a spacer 41 pressed into part 33 is directly opposite a hole 42 in the clutch body 34. In this position, the two clutch parts are in their relative neutral position.

In order to cause the two parts of the clutch to attain this position, the armature 33 of the clutch has two contact segments 43 and 44 which, by means of leads 45 and 46 are connected to a winding 47 on the rotary magnet 27. The winding 47 is center-tapped at 47′ and is connected to one terminal of the battery 38 if switch 37 is closed. The other terminal of the battery is connected by means of leads 39 and 39′ to a spring contact brush 48.

The operation is as follows:

If switch 37 is closed, motor 11 is excited, oil pump 13 is started and the transmitter 30 is ready for action. Furthermore, the electromagnets 36 are excited and the center tap 47′ of coil 47 is connected to the line. As long as there is relative positional disagreement between the two halves of the coupling, the spring brush 48 contacts one of the two segments 43 or 44. This causes a current to flow in one half of the winding 47 of the rotary magnet 27, which produces a motion of the armature 28 in such a direction that the shaft 26 of the rudder motor and, thereby, the part 33 of the coupling, follows the part 34 of the coupling. The position of part 34 is given by the lever 32 or by the position of the steering linkage 32′. The impulses causing follow-up motion of the rudder motor is of such a nature that in all cases it over-powers any impulse arriving at coil 31 from the transmitter 30. This assures the automatic follow-up action of the rudder motor no matter what the condition or action of the transmitter may be.

When relative positional agreement of the two halves of the coupling has been obtained, the spacer pin 41 is opposite hole 42, and the teeth 33′ and 34′ engage each other while part 33 of the clutch moves axially along the splines of the shaft 26′. As soon as positional agreement is obtained, coil 47 is disconnected because the spring brush 48 is now resting upon an insulated piece 49 located between the two segments 43 and 44. Even if the brush 48 should be somewhat wider than the insulated piece 49, the coil 47 is disconnected because the brush is not resilient enough to follow the part 33 of the coupling, whereby the connection between the brush 48 and the segments 43 and 44 is always interrupted.

Disengaging of the coupling after opening of switch 37, which disconnects the electromagnets 36, is assured by a helical spring 50 located between the two halves of the coupling, the pressure of which is somewhat smaller than that of the magnets when excited.

Although the above described arrangement has been developed especially for automatic steering devices for aircraft, it is understood that the same may be applied generally to stationary automatic regulators or servo motor controls.

ADAM KRONENBERGER.

PUBLISHED MAY 25, 1943. BY A. P. C.

A. KRONENBERGER

RUDDER MACHINES FOR AUTOMATIC PILOTS

Filed Nov. 13, 1940

Serial No. 365,430

Fig-1

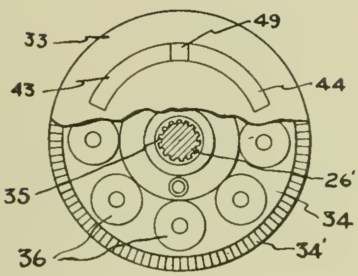


Fig-2

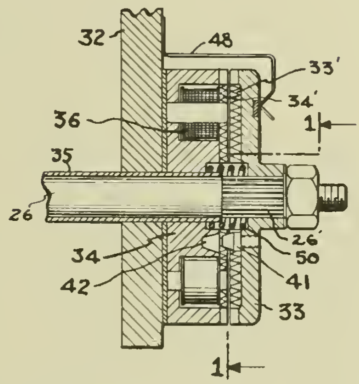
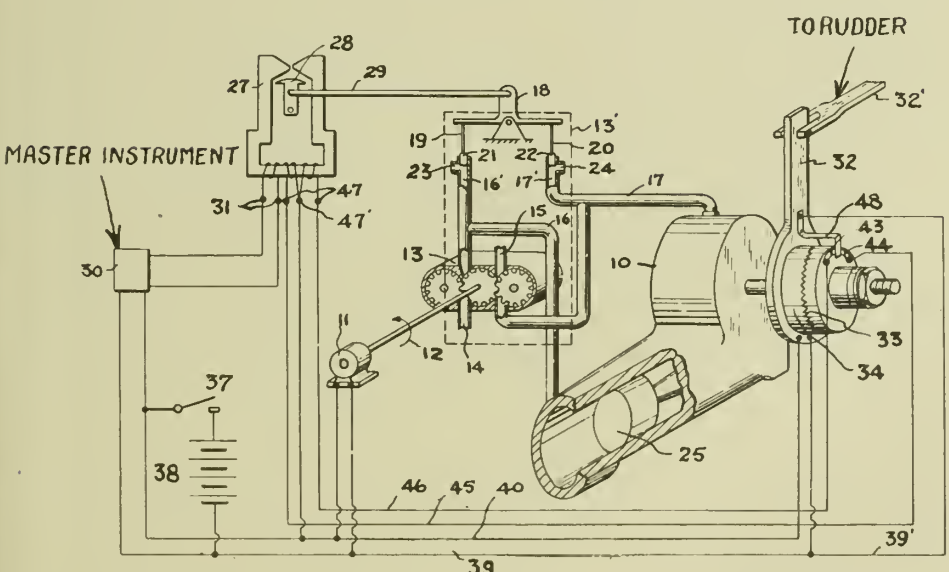


Fig-3



INVENTOR
ADAM KRONENBERGER
BY Herbert H. Thompson
his ATTORNEY.

Published May 25, 1943

Serial No. 365,560

ALIEN PROPERTY CUSTODIAN

FAULT INDICATOR DEVICE FOR AMPLIFIER TUBES

Hans Joachim Fründt and Wilhelm Schönfeld, Berlin, Germany; vested in the Alien Property Custodian

Application filed November 13, 1940

It is often desirable in practice to have available ways and means designed for automatic indication of tube defects. Such an arrangement would be particularly valuable and useful where equipment and outfit is concerned which comprises a large number of tubes.

What is employed for this purpose according to the invention is a circuit organization in which the failure of the emission current upon a tube being rendered defective or inoperable occasions the indicator device to respond.

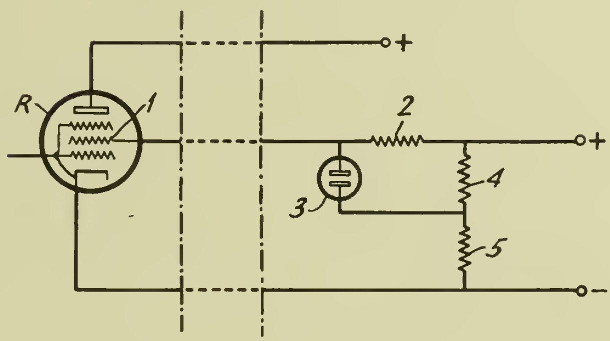
The drawing shows an exemplified embodiment of the object of the invention. The problem here is to check up on the tube R permanently. To this end the high potential required for the operation an electrode impressed with a positive bias is impressed upon this electrode across the resistance 2. The latter is of such a size that a considerable drop of potential is caused across it. In parallel relation to the source of potential supply is a voltage divider comprising the resistances 4 and 5. The telltale glow tube 3 is connected between the lead from the resistance 2 to the electrode 1 and the lead connecting resistances 4 and 5. In other words, the glow-tube or gaseous-conducting tube has one pole at the electrode potential. It is impressed through the voltage divider 4, 5, with a voltage which is considerably lower than the striking voltage. If, then, a tube defect arises so that the circuit to the electrode is broken the drop of potential across resistance 2 becomes zero. As a result the glow-tube 3 receives a potential which is far above the firing or striking potential. As a result the glow-tube 3 is caused to flash. The resistances may be readily proportioned so that the voltage change will be 50 V and over, this insuring safe and dependable indication or telltale action. Since a current will flow through the glow-tube only when the lamp has been struck the operation of the tube will not be impaired by this glow-tube.

The new arrangement, in spite of the limited circuit means which it requires insures permanent and uninterrupted control, and the latter in no way affects normal operations. The resistances of the glow-tube may be so chosen that most widely varying conditions can be met. If desired, the current which flows through the glow-tube may be utilized to cause actuation of another warning signal or alarm of an acoustic nature, say, a signal bell.

Where large installations of tubes are dealt with, all tell-tale glow-tubes may be united to form a panel so that such defects as may arise can be discovered immediately.

HANS JOACHIM FRÜNDT.
WILHELM SCHÖNFELD.

PUBLISHED | H. J. FRÜNDT ET AL | Serial No.
MAY 25, 1943. | FAULT INDICATOR DEVICE FOR AMPLIFIER TUBES | 365,560
BY A. P. C. | Filed Nov. 13, 1940



INVENTORS
HANS JOACHIM FRÜNDT
WILHELM SCHÖNFELD
BY H. S. Grover
ATTORNEY

Published May 25, 1943

Serial No. 365,712

ALIEN PROPERTY CUSTODIAN

COAT-HANGER WITH SINKING-BOW

Willi Besener, Berlin-Neukolln, Germany; vested in the Alien Property Custodian

Application filed November 14, 1940

The subject of the invention is a coat-hanger with sinking coat-bow. Those as yet known coat-hangers are too circumstantial and improper in their use. The now known and used coat-hangers consist of the bow which is either too stiff or can be taken to pieces and the hook on which the bow is hung on a rack or on some other hook. As in the most cases the coat-hangers are kept in the wardrobe, one must, if such a hanger wants to be used, get the same from there and take it in the vestibule or corridor to put then there the peace of clothes over the hanger and then on a hook which is fastened on the rack to hang the thing up. Whereas in the most cases big hooks are to be dealt with, which are fastened to the bow, they loosen themselves very often from the rack, slide over the same, and fall with the piece of clothes to the floor. Is the piece of clothes taken off the hanger then it can be done chiefly only from one side. Hereby the gravity glides to the other from the clothes yet covered side of the hanger which slides then from the hook and falls down too. But also when the hangers are hanging on the rack they are showing mostly an incorrect picture because they are hanging in all kinds of directions.

The object of this invention puts aside with all these lacks for it makes the fetching of a coat-hanger by demand unnecessary because the coat-hanger is in this way always at hand, and secondly a decent appearance is guaranteed, and thirdly a falling off of the hook is excluded. Finally is the bringing away of the coat-hanger not more necessary.

By a simple manipulation is the coat-hanger **1**, which, like copy **1** shows in the wall-board **2**, on which the clothes-hook and hat-hook **3** are fastened, let into by one under the bow **1** fastened cord **4** on which a ball **5** is sitting, pulled to the front. The coat-hook with hat-hook **3** are by two parallel running glide-rails **6** on the back-side of the wall-board **2** screwed on. The bow **1** is on a wire-rod **7** which can be moved forth and back of which the bow **1** can be pulled out of the wall-board **2** or pushed back again, is wound around by a spring **9** which presses the bow **1** near to the glide-rail **6**.

By taking out the hanger **1** of the wall-board **2**, one pulls the same, as soon as it has left its corresponding opening **12** in the wall-board **2** by the cord **4** with the ball **5**, out, and obtains by letting the ball **5** go, a sudden springing up of the hanger **1** again, whose exterior parts **10** which are screwed on by hinges **11** to the interior parts of the coat-hanger, a turning over of these parts to the right and left, and thus completness of the coat-hanger, which up to there crossed together, to save room, in its wall-board **2** provided opening **12**, has rested.

Is now the peace of clothes put over the coat-hanger **1** then the wire-rod **7** draws itself down and gives enough room for the collar of the clothes. Shall the hanger **1** be brought to rest then the peace of clothes is taken off, and the hanger **1** by the attached spring to the wire-rod **7** pressed to the glide-rail **6**. The both exterior parts **10** of the coat-hanger **1** are now to be put on the interior parts of the hanger **1**, and this one is to be pressed over the glide-rail **6** in its wall-board **2** contained opening **12**.

Thereby is an inobjectionable and correct looking of the coat-hanger guaranteed. Copy **4** shows the glide-rails **6** and the possibility of screwing on **13**, namely, the winding and the nut, for the fastening on the back-side of the wall-board **2**. Copy **5** shows the backside of the wall-board.

WILLI BESENER.

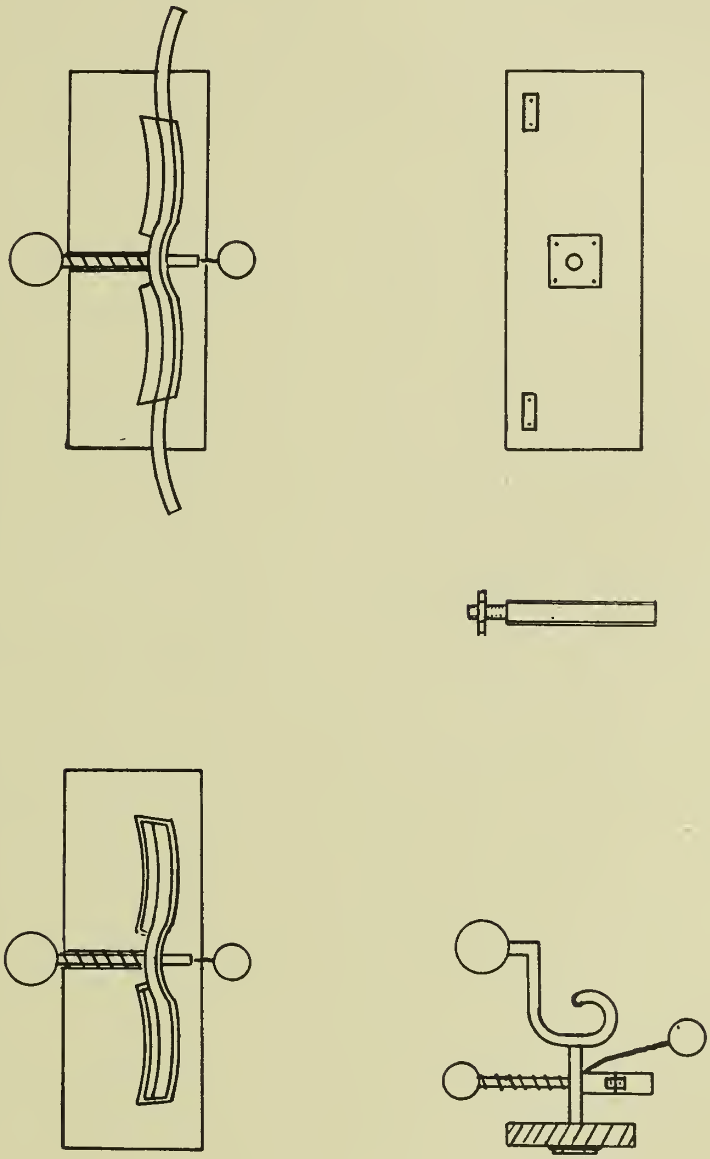
[illegible]

[illegible]

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. BESENER
COAT-HANGER WITH SINKING-BOW
Filed Nov. 14, 1940

Serial No.
365,712



W. BESENER

Published May 25, 1943 Serial No. 366,353

ALIEN PROPERTY CUSTODIAN

AEROPLANE FLOAT CAPABLE OF BEING EXPANDED AND CONTRACTED

Toyosaburo Nakagawa, Shimonoseki, Yamaguchi-ken, Japan; vested in the Alien Property Custodian

Application filed November 20, 1940

This invention relates to improvement in aeroplane float of the type wherein the float itself is capable of being readily expanded or contracted as occasion demands and has for its object the provision of an aeroplane float of such type which is of relatively simple construction and can be, on flying, contracted in a flat state to decrease air resistance thereof but expanded, on alighting, to avoid the shock due to the collision with water surface and to prevent the constructions and instruments from being damaged.

Another object of the invention is to provide an aeroplane float capable of deforming, owing to the elasticity thereof in response to the variation in height of water surface to insure the stability of the aeroplane.

Further object of the invention is to provide an aeroplane float of such type which would not lose the function for a float even if a part thereof will be damaged.

For realization of the object set forth, the aeroplane float according to this invention is characterized by the combination of one or more envelopes capable of being evacuated and charged with air and outer elastic cover enclosing whole of the envelopes so that it may be evacuated to flat on the occasion of its disengagement while on alighting it may be charged with air to expand in the form of a complete float.

The invention is more particularly described with reference to the accompanying drawings which show, by way of example two forms of embodiment, in which

Fig. 1 shows a longitudinal section of first embodiment according to the invention in the engaging state,

Fig. 2 shows similarly a longitudinal section thereof in the state in which the envelope have been evacuated,

Fig. 3 shows similarly a longitudinal section thereof in the state in which the envelope evacuated have been held in a taking-up chamber.

Fig. 4 shows a longitudinal section of second embodiment according to the invention in the engaging state,

Fig. 5 shows a longitudinal section of a part of the embodiment in the disengaging state in which only inclined links are different from those shown in Fig. 4,

Fig. 6 shows a longitudinal section of one inclined link in its extended state.

Fig. 7 shows a longitudinal section thereof in its contracted state.

Fig. 8 shows a perspective view thereof.

Like letters indicate like parts throughout the drawings.

Referring to the first embodiment shown in Figs. 1–3, the aeroplane float is consisted of an outer elastic cover 1 made of any suitable material and fixed to the aeroplane at appropriate parts thereof, for instance, under side the body or wing and one or more envelopes 2 which is (or are) fully enclosed in aforesaid cover. The cover 1 is communicated with an envelope taking-up chamber 8 which is made of, for instance, steel plate and arranged at a position adjacent the open end of the cover.

Of a pair of pulleys 4, 4', both being rotatably connected with each other through an endless belt 9, the pulley 4' is arranged inside the float at one end thereof opposed to the taking-up chamber 8, whilst the other pulley 4 is arranged inside the chamber 8 and connected rotatably through a cross belt with a rotating shaft 5 mounted inside the taking-up chamber 8. Said shaft 5 is driven by means of any suitable power transmission device (not shown in drawing). The envelope 2 is fixed, on the one hand, to the rotating shaft 5 through a string and the like 6, on the other hand fixed to the endless belt 9 at the position 7 thereof.

According to this embodiment, on the occasion of its disengagement, for instance, on flying, the envelope 2 exhausted may be kept in the strong taking-up chamber 8 as shown in Fig. 3. In the case of the float being engaged, for instance, on alighting, the envelope is at first, in accordance with the movement of the endless belt 9 driven by the shaft 5, pulled out of the chamber into the contracted cover 1 as shown in Fig. 2, thereafter it is expanded together with the cover 1 by means of air charging as shown in Fig. 1.

The envelope shown in Figs. 1–3 may be divided by partitions into several separate air chambers so that even if a part of the envelope will be damaged the residual air chambers may fully display the function as a float.

According to this invention it is possible to juxtapose a number of envelopes and to take up on a common rotating shaft in a common taking-up chamber by means of each endless belt belonging to each separate envelopes. Of course a large number of each separate float as shown in drawings, can be equipped at any suitable positions of the aeroplane.

In the second embodiment shown in Figs. 4–8 the elastic cover 1 made of the material similar to that shown in Figs. 1–3 encloses the float which is carried by the hollow supports 11 fixed

to the aeroplane at any appropriate parts thereof. The bottom plate 10 of the aeroplane is carried by the hollow sliding support 13 which may be upwardly and downwardly guided in the supports 11 through the screw bolts 12 engaged with the hollow support 11. The bottom plate is connected with the top plate of the float through a number of inclined links 14 each of which can be extended or shortened at will. Between them a suitable number of envelopes 2 are placed. The float of this type is usually in expansion condition as shown in Fig. 4 due to the action of the spring 15 placed in the hollow sliding support 13.

According to this embodiment on the occasion of its disengagement, for instance, on flying, the envelopes are at first evacuated and at the same time the screw bolts 12 are partly screwed out, whereby the sliding support 13 engaging with the head 16 of the bolt 12 may be raised in the hollow support 11, consequently the bottom plate 10 also may be raised towards the top plate opposing the action of the spring 15, as the result of which the float, owing to the contraction of the elastic cover 1, may be brought into flat state as shown in Fig. 5 (the construction and arrangement of the inclind links differ from those shown in Fig. 4). On the contrary in the case of the float being engaged, for instance, on alighting, through the reverse rotation of the screw bolt 12 and the air charging in the envelopes the float may be brought into expansion state as shown in Fig. 4.

It will be appreciated that the float according to the invention is, on flying, in flat state, so that air resistance acting on the float can be diminished. If the floats are arranged on the underside the wing, the flat float will have the same effect as that of the under side of the wing so that the charging amount of the aeroplane will be increased. Owing to the elasticity of the cover, particularly in the embodiment shown in Figs. 4–8 owing to the elasticity of inclined links, buffer action of springs and the like, the aeroplane equipped with the float of the invention is subjected to minimum shock, even if it should collide with water surface on alighting, so that the constructions and instruments of aeroplane can be prevented from the damage. As the float according to this invention may be varied in its shape in response to the variation in the height of water surface, the aeroplane installed with this float has a good stability. Even supposing that the cover will damage the aeroplane has no risk of sinking due to a number of envelopes remained.

Further the float according to the invention has a light draft, so that the taking-off of the aeroplane is very easy. In the embodiment shown in Figs. 1–3 if the envelope will be divided by means of partitions into a member of separate chambers or will be increased in its number, the float will not lose the function even if some of envelopes are damaged. In particular, in the first embodiment the envelope is held while flying in a rigid envelope taking-up chamber, so that there is diminished the risk of damage of the envelope by shot and the like. In the second embodiment the bottom surface of the float can be made in wide area, so that the rolling and overturning of the aeroplane on alighting may be avoided.

It will be appreciated that the floats above described are merely two preferred embodiments according to the invention, but that many modifications may be effected without departing from the scope of the invention.

TOYOSABURO NAKAGAWA.

PUBLISHED

MAY 25, 1943.

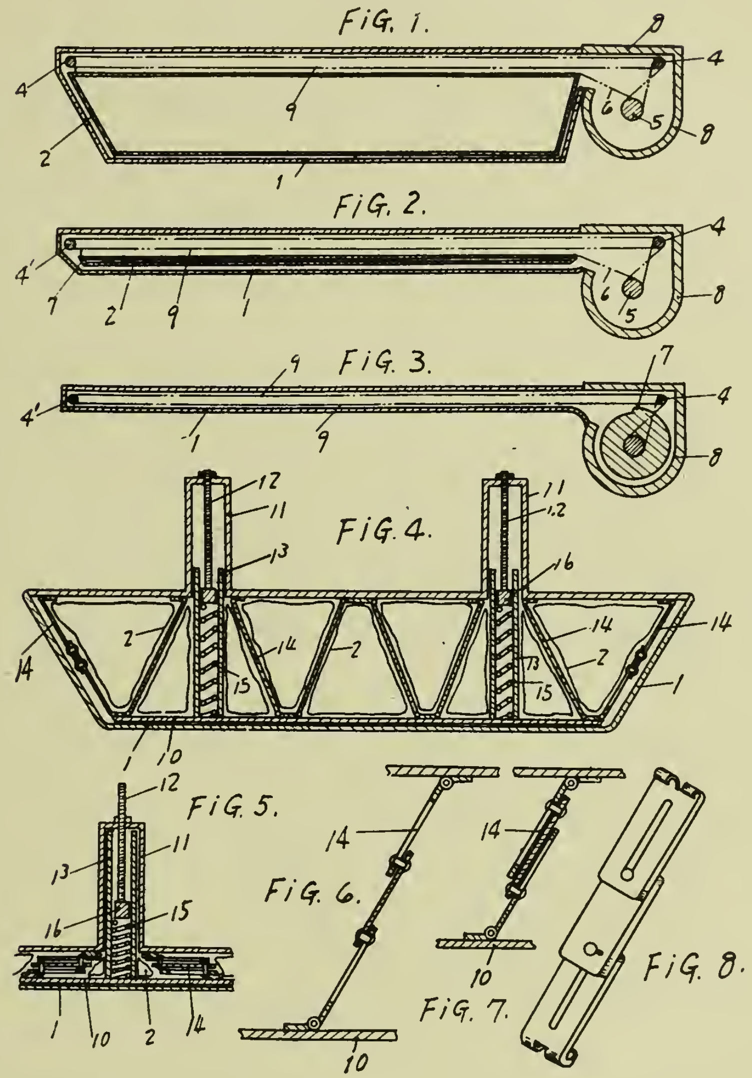
BY A. P. C.

T. NAKAGAWA

AEROPLANE FLOAT CAPABLE OF BEING EXPANDED AND CONTRACTED

Filed Nov. 20, 1940

Serial No. 366,353



Toyosaburo Nakagawa
INVENTOR

BY [signature]

his ATTORNEY.

Published May 25, 1943 Serial No. 366,933

ALIEN PROPERTY CUSTODIAN

RECORDING SPINDLES

Rudolf Hell, Berlin-Dahlem, Germany; vested in the Alien Property Custodian

Application filed November 23, 1940

The present invention relates to recording spindles known as Meyer spirals which serve for the facsimile transmission of characters, Morse signals or other signals.

To completely record at least a character on the receiving tape in the case of differences in synchronism between the signal transmitter and the spindle, the spindle is so designed that each image point of a character is scanned two times simultaneously and recorded. In this case the distance between two image points simultaneously recorded is equal to the length of a scanning line for a character. The lines or characters simultaneously recorded are therefore separated from one another a very small distance which may be varied to a slight extent only by subdividing the field of image. The lines recorded are arranged close to one another.

According to the invention the distance between two points recorded simultaneously is made in contradistinction to the known arrangements of this character greater than the length of a scanning line for a character. In this manner the individual records may be more easily separated and may be again utilized separately. This is not only advantageous in the case of a multiple record of a character but also in the case of the simultaneously recording of different characters by a spindle and separate magnet systems. The latter may then be easily arranged close to one another.

The distance between two spindle points which scan simultaneously may be attained according to the invention by arranging a plurality of spindles of the known type. The distance between the lines recorded may then be adjusted at will with the aid of intermediate members arranged between the individual spindles.

However, if the distance between two spindle points which scan simultaneously is made two or several times greater than the length of a scanning line of a character, a spindle may be employed with one or more threads which scan simultaneously and which are in part ground out in rings. The spindle serving to simultaneously record any number of characters may then be made of one piece, all threads being ground throughout their length and the rings ground out subsequently. A particular adjustment of the spindle threads to the same phase and a subsequent over-grinding as is necessary when employing a plurality of separate spindles owing to the great accuracy required in maintaining the diameter of the spindle (± 0.002 mm) are avoided.

Further details of the invention will be explained by reference to the accompanying drawings. Figs. 1 to 4 show the simultaneous record of two, Fig. 5 of three and Fig. 6 of four characters or Morse signals, in which h denotes the pitch.

In Fig. 1 is shown an embodiment in which two separate spindles are employed having each a thread which record simultaneously. The spindles are so arranged in spaced relation on an axis that the lines are recorded in the center of both halves of the tape separated by perforations. Instead of a receiving tape with perforations, a particular receiving tape may be allotted also to each line and all tapes may be driven by a common transport roller, irrespective of whether the arrangement serves for the simultaneous record of one or several characters. At all events the width of the paper tape can be chosen in such a manner that in the case of perforated tapes the lines recorded lie in the center of the tapes or tape widths allotted thereto.

Figs. 2 to 6 show further instances of the invention for spindles made of one piece and whose threads are at first ground throughout the entire length and then again ground out in rings. In Figs. 2, 3, 5 and 6 the distance between two spindle points which scan simultaneously is equal to two times and in Fig. 4 equal to three times the length of a scanning line for a character.

While in Figs. 1, 2 and 6 the spindles are single threaded and scan simultaneously lines of the pitch h during one complete rotation, the other figures show multiple threaded spindles, i. e., Fig. 3 a double-threaded spindle which scans a line during half a rotation. Three half threads are produced on the spindle, of which the central half thread is ground out.

In Fig. 4 is shown a sextuple threaded spindle. The length of the spindle amounts to $\frac{4}{6}$ of the pitch. In the center $\frac{2}{6}$ of the pitch is ground out.

In Fig. 5 the spindle length amounts to $\frac{5}{10}$ of the pitch, of which $\frac{2}{10}$ is ground out. Ten lines are simultaneously scanned during each rotation (spindle with ten threads).

In order to render legible a character on each tape in the case of fluctuations in synchronism, a double recording may be employed as shown in Fig. 6. Transmitter and receiver are preferably driven by synchronous motors. In this case the number of threads of the recording spindle may be so chosen that the spindle revolves with the same speed as the driving motor, only coupling members being necessary with the aid of which the phase is adjusted at the beginning of the transmission.

RUDOLPH HELL.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. HELL

RECORDING SPINDLES

Filed Nov. 23, 1940

Serial No.
366,933

Fig. 1

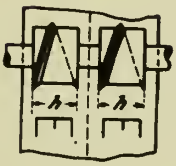


Fig. 2

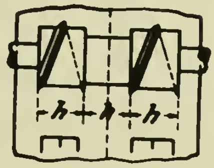


Fig. 3

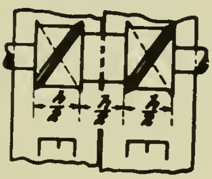


Fig. 4

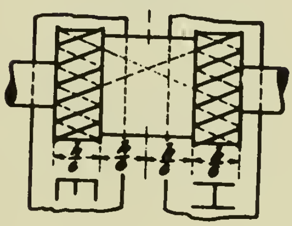


Fig. 5

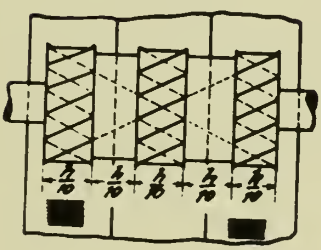
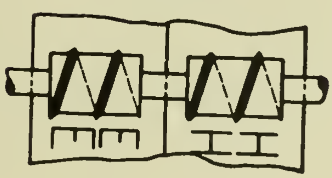


Fig. 6



Inventor:
Rudolph Hell
By Richardson & [illegible]
Att'ys

Published May 25, 1943

Serial No. 367,194

ALIEN PROPERTY CUSTODIAN

DEVICE FOR ENLARGING THE IMAGE OF RAPID OCCURRENCES, PARTICULARLY OF THE OSCILLOGRAM OF A BRAUM TUBE

Karl Kohl, Berlin, Germany; vested in the Alien Property Custodian

Application filed November 26, 1940

It is known to make electric occurrences visible by letting an electron current of a Braun tube strike a luminous screen and by subjecting the ray itself, while it passes through the tube, to a deflection or intensity control. These methods are of importance principally in television in which the Braun tube has proved to be a particularly suitable reproducing means. However, the control of the electron ray requires a certain amplitude of the control voltage or makes it necessary to amplify control voltages if they are too small. In some cases, for example in ultra high frequency occurrences, suitable amplifiers are not known so that, hitherto, it has practically not been possible to form more exact ideas of the oscillation occurrences in ultra high frequency oscillations.

The invention provides means for solving the problem mentioned above. It relates to a device for enlarging the image of rapid occurrences, particularly of the oscillogram of a Braun tube. The invention consists in making visible the magnified oscillogram produced by the cathode ray of the Braun tube by means of an electron microscope or amplified by a relay. Preferably, the oscillogram is produced by the cathode ray of the Braun tube on an intermediate screen with additional secondary emission. The intermediate screen may be constructed as a fine grid or as a foil of such thinness that the striking electron ray releases a corresponding secondary emission at the back of the intermediate screen. However, the electrodes, particularly those of the electron microscope system, may be arranged at the side so that the secondary emission issued at the front of the intermediate screen is received by the electron microscope arrangement. Before reaching the intermediate screen, the electron current may, if necessary by omitting the screen, be subjected to an intensity or deflection control. Instead of a receiving screen, a corresponding electrode or a system of electrodes may be provided, whose received current intensity is used for releasing relay or amplifier actions.

The invention is illustrated by way of examples in the accompanying drawing in which:

Fig. 1 shows a cathode 1 of usual construction, for example in the shape of a cylinder, in which the axis coincides with the axis of the emitted ray. 2 is a concentration cylinder. In the tube there are arranged electrodes 3, 4, 5, to which suitable electric potentials are applied and which cause the electron ray to be projected through corresponding openings in these electrodes upon the screen 6. 3 is a control electrode to which is applied the potential to be examined. Of course, instead of one electrode, several electrodes may be provided for the control. 7 represents a thin foil or a grid made of a substance emitting secondary electrons when being hit by an electron ray. These secondary electrons, naturally, travel in the direction of the maximum potential and are, therefore, drawn to the right, since the electrode 4 on the right, as indicated, has the maximum potential ++. But, owing to the high velocity imparted to the electrons, they fly through the electrode 4 as well as through the electrode 5, which has a somewhat lower potential than the electrode 4, and finally they hit the screen 6 mentioned above. Now, the electrodes 4 and 5 act like a system of electron microscope lenses as, owing to their presence, the ray 8 formed by the secondary electrons will, similar to a light ray passing through a glass lens, produce on the screen 6 an enlarged image of the original place of the secondary electron ray. Of course, the foil 7 must be very thin so that the secondary electrons are emitted sufficiently concentrated on the side facing the screen 6.

Fig. 2 shows a modification in which the surface 7 of the screen 6 is arranged so that the secondary electrons released at the front of the surface 7 will be received by the electron microscope 4, 5 and will appear on the screen 6 as an enlarged image.

On the other hand, an electron microscope arrangement may be provided between the control electrode or control electrodes 3 and the surface 7. If desired, the surface 7 may be replaced by the receiving screen 6. With the means described above, it is possible to make electric occurrences sufficiently visible even with the smallest control amplitudes and independent of the wave length or frequency employed. As this is connected with an amplification, the arrangement may be used as a regular amplifier or relay arrangement. In the last mentioned cases it is, for example, possible to use a regular electrode instead of the screen 6 or, if necessary, a system of several electrodes whose currents are influenced by the increased deflection or intensity control. Therefore, the new arrangement may be employed not only in television and the like, but may also serve any other purposes of amplification and releasing of relays.

KARL KOHL.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

K. KOHL

DEVICE FOR ENLARGING THE IMAGE OF RAPID OCCURRENCES, PARTICULARLY OF THE OSCILLOGRAM OF A BRAUN TUBE

Filed Nov. 26, 1940

Serial No. 367,194

Fig.1

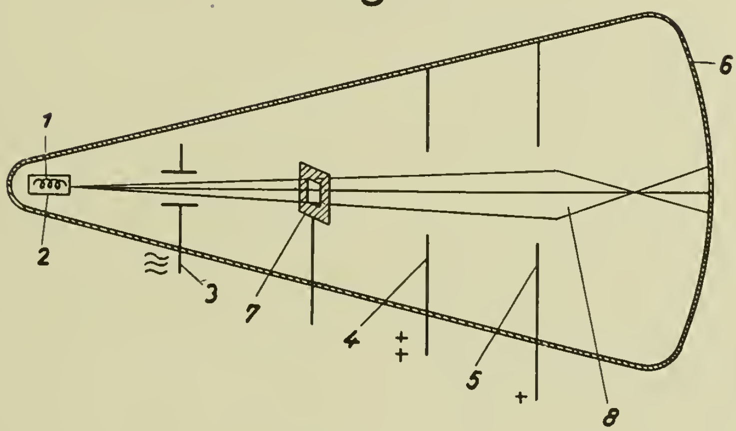
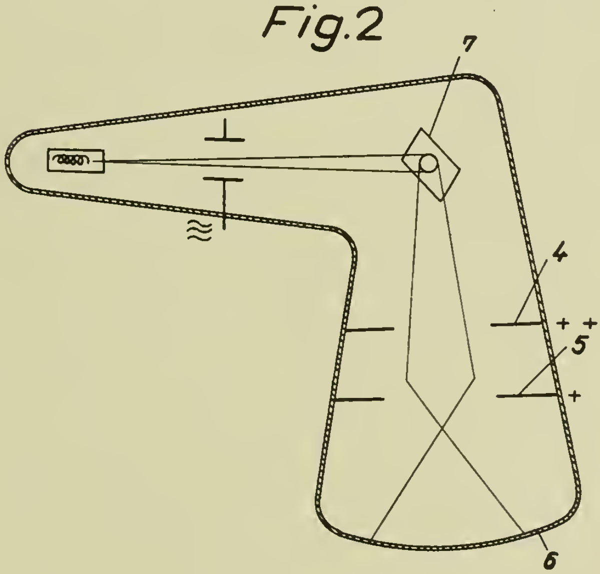


Fig.2



INVENTOR
Karl Kohl

BY Henry J. Lucke

HIS ATTORNEY

Published May 25, 1943 Serial No. 367,329

ALIEN PROPERTY CUSTODIAN

AUTOMATIC STEERING DEVICE FOR AIRCRAFT

Adam Kronenberger, Berlin, Germany; vested in the Alien Property Custodian

Application filed November 27, 1940

The invention relates to automatic steering devices for aircraft in which a directional transmitter controls a servo-motor through a relay. In systems of this kind the directional transmitter usually consists in a gyro instrument (as for instance a directional gyro or a gyro vertical) and in order to adequately dampen the movements of the craft, there are added to the basic control value according to the respective requirements further impulses dependent on the rotary speed or the rotary acceleration of the craft.

In order to obtain an effective control free from hunting it is essential that no material delay occurs between the disturbing influence on the craft and the counteracting deflection of the control surfaces. Furthermore the control surface should be restored to its normal position as quickly as possible after the disturbance has been compensated for. It is therefore necessary in the first place to avoid any difference in phase in the control apparatus causing the deflections of the control surfaces, for which reason it is advantageous to use a hydraulic servo-motor having comparatively small mass and operating substantially without delay.

The action of restoring the control surface to its normal position when the control value dies down to zero can be accelerated by replacing the aircraft steering devices as in common use by a steering gear which is yielding against the exterior forces acting upon the control surface. Such an arrangement may be obtained for instance by alternate throttling of two pressure fluid streams which are carried to either side of the servo-motor prior to passing through the throttling orifices. In such a controlling gear a state of balance is established between the relative wind acting upon the control surface and the liquid pressure supplied to the servo-motor in response to the steering values derived from the controlling instruments. When the steering value becomes zero the deflection of the control surface becomes zero likewise without the necessity of reversing the servo-motor as would be the case in self-locking steering gears. In order to maintain such deflection of the control surface as is necessary for overcoming the disturbance, a constant liquid pressure will, however, be required in such yielding control gear in the case of a constant disturbance of the balance of the craft due for instance to failure of one lateral motor. Therefore according to the invention I use a servo-motor yielding against external forces acting on the control surfaces in combination with an unrestrained relay, the speed of movement of which is dependent upon the amount of the control values. When a disturbance occurs, the relay is brought in the position necessary for the elimination of such disturbance, whereby a certain liquid pressure and a corresponding deflection of the control surface are produced. This deflection is maintained even after the craft has attained the desired position and the initial control value has become zero with the result that a torque balancing the disturbing moment is constantly exerted on the craft. This deflection of the control surfaces is maintained until the constant disturbance has been eliminated and is then nullified by means of a countercontrol value restoring the relay to its middle position. The returning of the control surfact is caused by the relative wind while the servo-motor is only being relieved of the control pressure. In a self-locking steering gear, on the other hand, a countercontrol is required for the returning of the control surface to its middle position, as in this case the restoring force of the relative wind is not utilized. Now the reversal of a rudder motor inclusive the rudder takes considerably longer than the reversal of a relay, which is of light construction and thus controllable at a corresponding high velocity. Another advantage in the use of a resilient servo-moter is that it requires but little driving power whilst the control surface is in its middle position, while the self-locking hydraulic gears commonly used run constantly under full load.

A Ferraris motor may advantageously be used as relay as it is readily reversible due to the small mass of its armature. In order to avoid overcontrol, the motor revolutions may be limited by an impulse derived from the velocity of the control surface. This can be achieved in such a way that a contact brush sliding over a voltage divider is connected to the rod system of the servo-motor. The two branches of the voltage divided are connected with the two condensers to a Wheatstone bridge. By this means the compensating voltage resulting from the displacement of the sliding brush becomes an index of the velocity of the control surface. By transmitting this impulse after appropriate amplification to the relay, a force is opposed to the other control values, and the deflection of the control surface is restricted.

The impulse may be amplified by means of a choking coil amplifier. A simple way of mixing the control values is that of providing the amplifier with several magnetizing windings, each winding being connected with one transmitter.

Further details concerning the invention are

apparent from the following description of an embodiment of the invention.

The drawing represents schematically an automatic steering gear in which the control impulses act through the choking coil amplifier upon a Ferraris motor serving to set a hydraulic servo system.

A gyroscope with two degrees of freedom acts as the controlling element to determine the rotary velocity and rotary acceleration of the craft about its vertical axis. The horizontal rotary axis of the gyro rotor 1 is supported in a frame 2, which is in turn rotatable in a gimbal ring 3 about a likewise horizontal axis which is vertical to the first axis. The gimbal ring is adapted to turn slightly about a vertical axis 4. In a manner not shown the gimbal ring 3 and the rotor carrier 2 are restrained in their middle position relative to the casing, the restrainment being strong for the gimbal ring while it is comparatively slight for the rotor carrier. Thus the gyroscope may precess a fair amount about its horizontal axis at turns performed by the craft about its vertical axis, the movements being proportional to the turning speed, while a moment corresponding to the turn acceleration acts upon the gimbal ring to turn about its vertical axis 4. An armature 5 playing between two coils 6 and 7 is secured on the gimbal ring. According to the position of the armature relative to the coils 6 and 7 the reluctance of the coils and hence their mutual induction is varied. Consequently the voltage supply through the winding 8 of a transformer 9 meets with corresponding differences in resistance with the result that different currents are produced in the windings 12, 13 of two amplifier chokes 14, 15 connected via a rectifier 10, 11. Premagnetizing windings 16, 17 connected via variable resistors 18, 19 and a full-way rectifier 20 with a winding 21 of the transformer 9 serve to adjust the most favorable working point on the magnetizing curve of the amplifier.

Two further magnetizing windings 22, 23 are mounted on the amplifier chokes 14, 15 for transmitting the course deviation, said magnetizing windings being controlled, in a manner which need not be described, by means of a directional gyroscope not shown. The control values are mixed, amplified and supplied to a Ferraris motor 26 through control windings 24, 25. Windings 27, 28 communicating with the motor windings 24, 25 connect the exciting voltage supplied by the winding 29 of the transformer 9 to the amplifier chokes. The exciting voltage for the Ferraris motor is supplied by a further transformer winding 30 connected to the corresponding motor windings 31 and 32. In order to obtain the necessary phase displacement, a condenser 33 is inserted in this circuit.

The armature 34 of the Ferraris motor 26 drives a worm 36 through a reduction gear 35, the worm engaging with a worm wheel 37. The latter is adjustable about its axle 38 and serves to control a seesaw 39 of a hydraulic setting gear. Two small valve pistons 40, 41 are provided for alternate throttling of outlet orifices 42, 43. The pressure fluid is circulated by means of an electrically driven three-gear pump. When at an inclination of the seesaw one of the outlets is throttled, pressure is created in the corresponding control line 45, 46, respectively, whereby the vane 47 of a rotary piston 48 is set in motion causing a deflection of the rudder 49.

On a shaft 50 connecting the piston 48 with the control surface, a sliding brush 51 is mounted so as to be insulated. This brush slides over a voltage divider which is mounted rigidly relative to the craft and both ends of which communicate with the output end of a full-way rectifier 53 fed from a winding 54 of the transformer 9. Two condensers 55, 56 are connected with the two branches of the voltage divider 52 so as to form a bridge circuit. A conduit 57 branches off between the two condensers, leading to a control winding 58 of the amplifier choke 15. A corresponding control winding 59 secured on the choke 14 is connected in series with the winding 58 and communicates via a line 60 and a spring contact 61 with the tap 51 of the voltage divider 52.

With a view to explaining the mode of operation of the directional steering gear let it be assumed that the craft is thrown out of its course by a gust of wind. To compensate for the disturbance it is necessary that the control surface be deflected to the right which is effected in the following manner: At a standstill of the steering gear the resistors 18, 19 are set so as to produce a certain premagnetization resulting in the two amplifier chokes 14, 15 being each about half saturated so that the currents passing through the two control windings 24, 25 of the Ferraris motor 26 are equal and therefore balance one another. On account of the assumed turning of the craft to the left, the armature 5 executes a relative movement upwardly in the direction of the arrow 62, as the gyroscope as a mass of great inertia tends to maintain its position in space. Thereby the resistance of the choke 7 declines and the current in the control winding 13 of the lower choke 15 gains in strength while on the other hand the current in the winding 12 of the choke 14 declines. The directional gyroscope (not shown) acts in the same sense on the windings 22 and 23. Due to the enhanced magnetization of the choke 15, the current in the output winding 28 increases likewise so that it preponderates over the declining current in the winding 29 of the other amplifier choke. Consequently the field of the control winding 25 of the Ferraris motor is stronger than that produced by the winding 24, and the armature 34 commences to turn with corresponding speed in a sense so as to cause an over-pressure to be produced in the foremost chamber fed by the line 46 of the servo-motor 48, with the result that the control surface deflects to the right as shown by the arrow 63. In this connection it is requisite that the seesaw be turned clockwise, whereby the cross section of the discharge orifice 43 is reduced and a pressure increase in the conduit 46 is produced.

The restoring system 51—61 provided for restricting the speed of the control surface restricts the control impulse in the following manner:

While the control surface is moving in the direction indicated by the arrow 63, the voltage at the condenser 55 is reduced and that at the condenser 56 increased. Be it assumed that the line 64 possesses a positive potential and the line 65 a negative potential corresponding to the direction of the arrows near the rectifier 53. Then a compensating current is created upon the displacement of the brush 51 in the direction of the arrow 63, said current being in the direction of the arrows 66, 67. Thereby in turn a current is produced in the windings 58, 59 in the direction of the arrow 68. This current flows in a direction opposite to that of the current passing

through the windings 12, 13 (as well as that in 22, 23) balancing same at a correspondingly high rotary speed of the control surface 63 causing the armature 34 of the motor 26 to come to rest.

The compensating current should be proportional to the rotary speed of the control surface. This is achieved by keeping the time constant of the compensating process sufficiently small by corresponding dimensioning of the condensers 55, 56 and of the respective resistors. Under these conditions the electric combination represents a differential gear electrically reproducing the speed of the control surface. The compensating current flows only until the charges of the two capacities 55, 56 balance the voltages existing at the potentiometer 51, 52. (The charges of the condensers are of course given by the proportion voltage to capacity). When the control surface comes to a standstill the compensating process is practically terminated, so that there is then no current in the lines 57, 60.

In case the seesaw has not been fully deflected, the control surface comes to a standstill as soon as the control presure and the relative wind acting on the control surface balance. In a servomotor system which is non-yielding relative to exterior forces it would be necessary for the motor 26 to reverse in order to cause the control surface to come to rest, as in this case the engine working pressure is constantly effective as long as the relay is deflected from its middle position.

ADAM KRONENBERGER.

PUBLISHED

MAY 25, 1943.

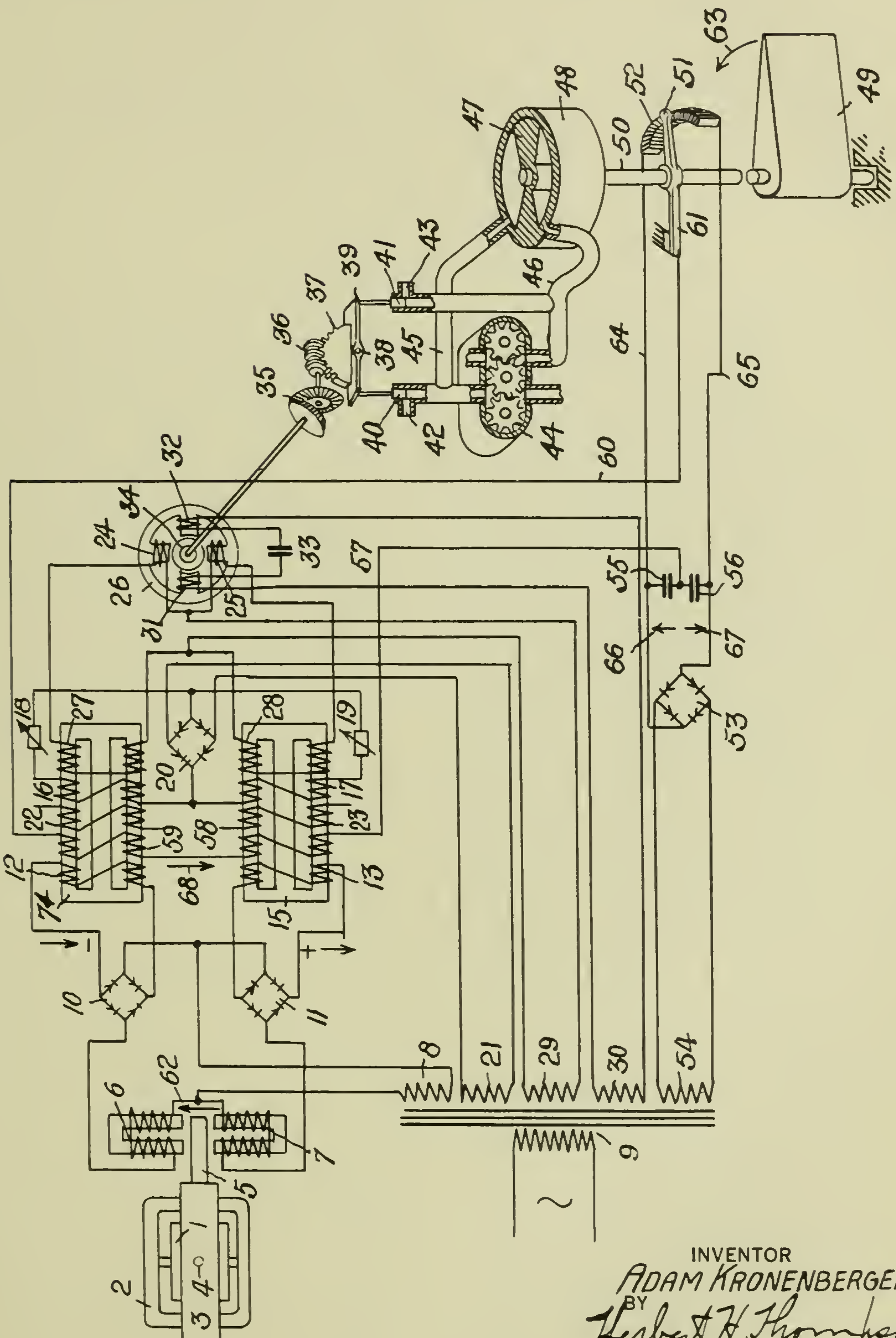
BY A. P. C.

A. KRONENBERGER

AUTOMATIC STEERING DEVICE FOR AIRCRAFT

Filed Nov. 27, 1940

Serial No. 367,329



INVENTOR

ADAM KRONENBERGER

BY Herbert H. Thompson

his ATTORNEY.

Published May 25, 1943

Serial No. 367,424

ALIEN PROPERTY CUSTODIAN

TRANSMITTING ARRANGEMENT FOR AEROPLANE NAVIGATION

Karl Kohl, Berlin, Germany; vested in the Alien Property Custodian

Application filed November 27, 1940

Air traffic is often endangered by the fact that the visibility of the surface of the earth is rendered bad or quite impossible by fog, rain, or darkness. Therefore, it is endeavoured since long to develop devices enabling to fly blindly, i. e. independent of weather conditions, etc. Apart from finding the way, it is particularly important for the pilot of the aeroplane to know the height at which he is flying.

In order to determine the height of the aeroplane, it has been proposed to radiate from the aeroplane some kind of electric or other waves towards the surface of the earth and to use the period which has elapsed between the transmitting and the return of the waves for indicating the height. Furthermore, it has been proposed, for keeping the correct height in landing, to arrange landmarks establishing a straight or curved line in space, which line the aeroplane is able to follow with suitable receiving devices.

Contrary thereto, the present invention relates to another manner of facilitating the correct conduction of the aeroplanes and at the same time giving information with respect to the height at which the aeroplane is flying.

For this purpose, the invention proposes to equip the entire traffic area with small transmitters radiating substantially in upward direction, and to let these transmitters give certain informations by special signals or by modulation or by language, informing the pilot about the respective local conditions, the height at which the transmitter is arranged, the position with respect to other transmitters in the neighbourhood, or about the degree of geographical longitude or latitude. If the transmitters are always operated with the same energy, the height may be determined by using the intensity of the radiation in upward direction as a measure for the height above the surface of the earth. If it is also known, by the signal of the respective transmitter, from what height this transmitter is radiating, these two data together enable to also determine the absolute height.

In the accompanying drawing, Fig. 1 illustrates a larger area equipped with a number of transmitters **2** which may, for example, be placed in the points of intersection of an imagined geographical survey. These individual transmitters thus represent various wireless beacons which, however, contrary to the hitherto used wireless beacons, are not arranged along a way to be followed, but are uniformly distributed over the entire area. Of course, it is possible to mark them in a special manner so that the reception of only one signal or of two neighbouring signals will be sufficient for the aeroplane to exactly determine its position.

Fig. 2 shows the arrangement of the bearing transmitter **2** in vertical relation. **3** is a reference of surface altitude, for example mean sea level. Then, **4** are the individual absolute altitudes of the transmitters **2**, radiating a cone of rays **5** in upward direction. These rays **5** will then possess, as mentioned above, a distinguishing mark giving the respective information about the absolute altitude of the transmitter. Now, the aeroplane may be provided in a simple manner with devices which make it possible for the aeroplane to be kept more or less automatically at a definite altitude above the surface of the earth or, in case of suddenly occurring unevennesses of the surface, at a definite absolute altitude. Apart from being kept at a definite altitude, the aeroplane may also be given beforehand the exact direction to be followed. Of course, this may be effected most simply by stating the call signals or distinguishing marks of the transmitters to be passed on the way, or also automatically by corresponding bearing devices forcing the aeroplane without external action by the pilot to fly towards the transmitter to which the bearing devices are set, and upon reaching of which the bearing is automatically adjusted to the next suitable transmitter.

Moreover, the new arrangement of transmitters may also be used advantageously in the landing of an aeroplane. For this purpose, the pilot just has to fly in a direction easily defined by successively arranged suitable transmitters and may then, with the aid of a simple intensity observation, adjust the most favourable inclination of the plane of flight and in this way safely descend right to the actual landing.

The new special arrangement, therefore, provides a very easy and clear way of finding the position, prevents collisions with sudden elevations of the ground, enables to maintain a definite relative or absolute altitude of flight, and finally makes it possible to land at any desired place and to follow any desired direction. The proposed arrangement of transmitters is not at all expensive, since the transmitters employed only need to possess a very small capacity. Accordingly, the largest possible number of transmitters will be uniformly distributed over the entire area.

KARL KOHL.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

K. KOHL
TRANSMITTING ARRANGEMENT FOR
AEROPLANE NAVIGATION
Filed Nov. 27, 1940

Serial No.
367,424

Fig.1

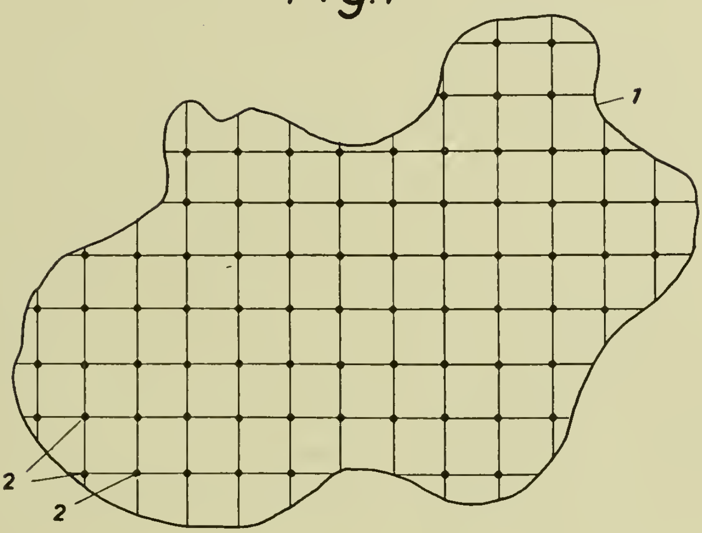
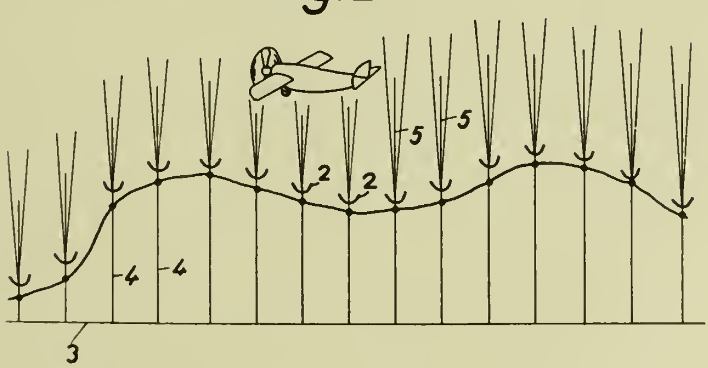


Fig.2



INVENTOR
Karl Kohl

BY Harry J. Lucke
HIS ATTORNEY

Published May 25, 1943

Serial No. 367,666

ALIEN PROPERTY CUSTODIAN

REACTION PROPELLING DEVICE FOR AIRCRAFTS

René Anxionnaz, Paris, and Roger Imbert, Mantes, France; vested in the Alien Property Custodian

Application filed November 28, 1940

It is known that, in airplanes flying at very high speeds, the tips of the propeller blades should reach a relative velocity with respect to air equal to or higher than velocity of sound at the height that is considered. This produces a considerable increase of the resistance to the movement of said blades, which involves a considerable drop of output, occurring for speeds of the airplane higher than 500 kilometers per hour (which corresponds to a velocity of the blades averaging 300 meters per second), and a practical impossibility for airplanes of a speed higher than 700 kms per hour.

It should be noted that the same difficulty occurs for the wings of the airplane but only for higher speeds, say 900 or 1000 kms per hour.

The object of the present invention is to provide a propelling system which overcomes this difficulty for speeds of the airplane higher than 500 kms per hour.

According to the present invention, I make use of a reaction propelling device in which the driving power is transmitted to air by airscrews or helicoid wheels the relative velocity of which with respect to air never reaches the velocity of sound, this result being obtained by slowing down the flow of air when entering the propelling device and accelerating it as it leaves said propelling device.

Other features of the present invention will result from the following detailed description of some specific embodiments thereof.

Preferred embodiments of the present invention will be hereinafter described, with reference to the accompanying drawings, given merely by way of example, and in which:

Figs. 1 to 8 inclusive and 11 to 16 inclusive show, in diagrammatic section by the vertical plane of symmetry of the airplane various embodiments of the invention, respectively;

Figs. 9, 9*a* and 10 are transverse sectional views of an improved airplane wing made according to different features of the present invention, respectively;

Fig. 17 shows the arrangement of the propelling system according to still another embodiment of the invention on an airplane wing;

Fig. 18 is a plan view of an airplane provided with a propelling system according to the invention.

Fig. 1 is intended to illustrate the principle of the invention;

Air from the atmosphere enters the propelling device through orifice 1 with the total relative pressure corresponding to the speed of the airplane. It passes through the divergent nozzle or inlet 2, which has gradually increasing sections and in which the air velocity is gradually reduced, its mean velocity at the rear end of said divergent inlet being

$$v_1 = v_0 \times \frac{s_0}{s_1}$$

s_0 being the front section and s_1 the rear section of the divergent inlet. This divergent inlet can be reduced or even eliminated owing to the use either total or partial of recompression at the front of the fuselage.

After having passed through this divergent inlet, the air comes to compressor 3. On the drawing, this propelling compressor is of the multicellular type, with helicoid blades 5 and stationary blades 6. But this compressor may be of the mono-cellular helicoid type, or even constituted by an airscrew, according to the particular conditions of velocity and power to be obtained.

When issuing from the propeller or compressor, the air still moves with an axial velocity approximating v_1, but it has been given a pressure higher than that it has at the inlet. This air is then expanded in a nozzle 4, in which it is given a velocity v_2 higher than the velocity v_0 of the airplane, and through the exhaust of this air into the atmosphere, the system is given a frontward impulse proportional to the mass of the air in movement and the difference between the velocities v_2 and v_0.

This impulse or forward thrust replaces the action of the airscrew of an ordinary airplane and ensures the propulsion of the whole.

It will be seen that, by choosing the sections s_0 and s_1 of the divergent inlet and by taking for the propeller or compressor a sufficiently low peripheral velocity, it is possible to bring back the relative velocity of air with respect to the driving blades to a value which can be chosen in advance. In particular, this relative velocity can be chosen lower than the velocity of sound or a given fraction of this velocity even if velocity v_0 is itself higher than this value and a fortiori the whole range of problems in which, v_0 being lower than the velocity of sound, it is impossible to provide an airscrew having a good efficiency and the relative velocity of which at the ends of the blades is sufficiently below this velocity of sound.

As the velocity of sound in air increases with the temperature thereof and the compression produced by each wheel causes a heating of the air, it will be seen that the critical velocity of the

air will be higher after its passage through the first wheel than before.

Therefore, it will be possible to make use for the second wheel of a peripheral velocity slightly higher than the first, which permits of making this second wheel of a slightly greater diameter, and so on for the successive wheels.

Fig. 2 shows a propeller made according to this arrangement, in which the diameters of the successive wheels 25, 26 and 27 are increased from one to the next one.

In order to adjust the propeller to the various conditions of operation of the airplane, which differ to a great extent, according as the airplane is flying close to the ground or at a great height, in a straight horizontal line or along a climbing path, an adjusting device has been provided.

This device, which is shown by Fig. 3, consists of one or several shutters 7, pivoted about a spindle 8 and which permit, according to their angular position, of varying the section of the nozzle outlet. These shutters are controlled by the pilot through a suitable transmission; of course, the pilot adjusts the power of the engine in the ordinary way through the gas throttle, but, further, the operation of shutters 7 makes it possible for him to adjust the propelling system to all the conditions of operation as may occur.

In particular, the opening of the shutters will correspond to a greater power and their closing to a lower power for the same velocity of operation.

On the other hand, it is clear that, when the orifice of this nozzle is increased, the velocity of exhaust v_2 of the air decreases but the mass of air brought into play increases. This arrangement is advantageous for obtaining a high propulsion force with a good efficiency when the speed of the airplane is relatively low.

On the contrary, when the speed of the engine increases, the shutters 7 will be arranged in such a position as to decrease the area of the nozzle orifice, which increases the outflow velocity v_2. thus maintaining the efficiency at high speeds and thus makes it possible to obtain, for the airplane, a high impulse at high speeds.

Likewise, the operation of these shutters will make it possible to adjust the operation of the system when the height varies.

Of course, these shutters can be replaced by any known means for varying the section of nozzle 4.

Another device for adjusting the propeller, which can be used separately or in combination with that above described, consists in giving different angular positions to the blades of the compressor which in this case, can be rather easily built in this way owing to the small weight of the blades and to their relatively low velocity, either simultaneously or not with a displacement of the stationary blades of said compressor. It is possible through either of these means, or through the combination of both, to modify the characteristics of the compressor, for adapting it to the various working conditions.

In particular, it may be very advantageus to adapt the compressor to the working at great height in such manner that it utilises, at this time, the full power of the engine; but in this case, when the propeller is working on the ground level, the power absorbed by the compressor would be too great for the engine. In order to remedy this, I may vary the angular direction of the blades of one or several wheels so that the power it absorbs decreases or even becomes practically zero. Likewise, it is possible, either simultaneously or not with the above mentioned means, to vary the angular position of the blades of one or several of the stationary guide wheels so that, through the resulting modification of the relative direction of the air in the following wheels, the power it absorbs is reduced or even made practically zero.

Finally, it is also possible to reduce the power absorbed by the compressor by disconnecting one or several wheels which will then turn freely about their shaft and will absorb practically no power, or again by releasing one or several row of stationary blades, so that this row then turns under the action of air.

This arrangement is shown by Fig. 3*a*. In this embodiment, the row of stationary blades mounted on wheel 65, placed between wheels 66 and 67, can, when left free to move, turn about the shaft, owing to the provision of ball bearings 68.

Under normal working conditions, this wheel 65 is locked with respect to the body of the compressor, by means for instance of an external disc 69 which can be tightly held between two annular elements 70 and 71 or in any other releasable manner.

When disc 69 is released, by moving discs 70 and 71 away from each other, wheel 65 starts turning on its ball bearing under the effect of the air flowing through the compressor and it assumes a velocity such that the whole of the two wheels 66 and 67 now produces only a work corresponding to a single one. This arrangement, which is easy to build, is particularly advantageous.

It is also very advantageous, for an airplane flying at high speed, to be able to produce a true braking action of said airplane. The propelling system according to the invention makes it possible easily to obtain this braking by means of the arrangement shown by Fig. 4.

This arrangement consists of a shutter 9 which in normal flying position is retracted along the edge of nozzle or on the outside of the jet of fluid issuing from said nozzle, so as to produce no detrimental resistance. For instance, this shutter may be, in this case, retracted in a housing 10.

When the pilot desires to produce a braking of the airplane, it brings shutter 9, through any suitable control means, into a position such as that shown by the drawing.

It will be readily understood that, in this position, the jet of air issuing from nozzle 4 is deflected toward the front and discharged into the atmosphere in a frontward direction and with a very high velocity. Instead of being directed in the direction in which the airplane is travelling, the thrust produced by the reaction of the turbine is then directed in the opposite direction and consequently produces a braking effect which may be of great intensity. This arrangement may be advantageous, for instance, in the case of fighting planes and also to facilitate the landing of all airplanes. It will be noted that this arrangement gives, in opposition to the known braking devices making use of flaps, a braking action which does not tend toward zero when the speed of the engine becomes zero. Furthermore, such a braking arrangement eventually permits of leaving the engine in full power running operation while braking it or keeping it stationary (when on the ground, or when landing or during a fight, in order temporarily to remain

behind a slower plane and at good range with respect thereto).

On the other hand, it is possible to increase the useful work produced by the nozzle by heating the air after it has been compressed and before it is expanded in said nozzle. It is known that, under a given pressure, the rate of flow of air through a nozzle is the higher as its temperature is higher. On the other hand, it has been above explained that the thrust of the propelling device increases together with the outflow velocity of air. Therefore, if, without changing any other condition of working of the propelling device, the gases are heated before they pass through nozzle 4, the thrust, and therefore the useful power of the propelling system is increased.

First of all, it is possible to produce this heating without any supplementary consumption of fuel, by sending the exhaust gases of the engine into the air flow before the latter passes through the nozzle.

It is also possible to place, at this point, and before the exhaust, the radiators which serve to the cooling of the water circulating in the engine and eventually of the lubricating oil. I incorporate to the air, in order to obtain a good utilization, all the calories which, otherwise, would be lost through the exhaust and by the cooling of the engine. Such an arrangement is shown by Fig. 5.

In this embodiment, 12 is the engine and 13 designates the radiators for the cooling of the engine water and oil.

The exhaust gases from engine 12 are led to a main 12 which, in this case, has been shown in the form of a tore, but which might be of any other shape. From this main, these gases escape to mix with the compressed air.

In order to avoid creating a supplementary resistance to the flow of air and a counterpressure on the exhaust, it is preferable to produce the mixture of the gaseous streams through means such that the velocities of the air and the gases are substantially in the same direction.

However, within the scope of the invention, this mixing can be made in any suitable manner.

It would also be advantageous, in some cases, to divide the exhaust main into two or more elements, each of these elements receiving the exhaust from one cylinder or one group of cylinders chosen in such manner that their exhaust into a common chamber do not interfere with one another.

It is also possible, in order to utilize the whole of the heat given off to the outside by the engine, to place said engine, or at least the cylinders thereof, in the air jet itself before the passage of said jet through nozzle 4. This arrangement is particularly advantageous in the case of air cooled engines because, in this way, the cooling of the engine is perfectly ensured and all the calories thus given off by the engine are incorporated to the air for raising the temperature thereof and increasing its useful work.

Fig. 6 shows this arrangement in the case of an engine having its cylinders disposed along one or several lines or rows. In this drawing, the exhaust gases from the engine mix at 14 with the compressed air before the passage of said air through nozzle 4.

Fig. 7 shows the same arrangement in the case of a radial engine, this type of engine being particularly well adapted to a combination of this kind.

In this drawing, the cylinders 15 of the engine are bathed in the air leaving the propeller and their exhaust gases escape directly into this air through nozzles 16.

When it is further desired to increase the thrust of the propelling device, it is possible to raise the temperature of the air by means of a supplementary heating, which may be constituted for instance by one or several burners 17 to which a supplementary amount of fuel is fed. These burners are preferably distributed in the air stream so as to produce a temperature as evenly distributed as possible. Such an arrangement has the disadvantage of necessitating a supplementary consumption of fuel which is not utilized with a very good efficiency and, consequently, the total efficiency of the system is somewhat reduced during the periods for which the supplementary burners are utilized. However, this arrangement has the very considerable advantage of permitting the obtainment of an excess of power, which is advantageous when this excess of power is necessary only for a short period, for instance for taking off, for climbing, or while the airplane is engaged in a fight. In this case, the consumption of fuel is of little importance since it lasts for a very short time. This method, which can be applied whatever be the type of means used for driving the propeller, has the very great advantage of being paid neither by a substantial increase of the weight of the airplane nor by any reduction of the efficiency of the motor means and the propeller when running under normal power conditions.

The detail arrangements shown by the above mentioned drawings have been chosen by way of example in order to permit of explaining the operation of the propeller, but modifications might be made thereto without for this reason departing from the principle of the invention. For instance, Fig. 8 shows a modification in which the engine is placed ahead of the propeller.

In addition to the advantages already set forth concerning the propeller, and to which must be added the high efficiency of the whole, especially in the case of the calories from the exhaust gases and from the cooling of the engine being recuperated, which permits of providing propelling systems the apparent efficiency of which may be as high as, and even higher than 1, the invention permits of obtaining a certain number of devices which are of very high interest for the handling and operation of the airplane in flight.

Among these devices, the chief are the following:

First, the reaction nozzle 4 may be provided with deflecting shutters or flaps 18 (Fig. 8) the angular position of which is controlled by the pilot. These flaps permit of directing at will the air jet leaving the nozzle and therefore of giving any desired direction to the thrust produced by said jet. It follows that a high transverse force can thus be applied to the airplane, which permits of taking sharp turns for instance and ensures a great facility of manoeuvre comparable to that obtained with pivotable propellers in the case of boats.

It goes without saying that deflectors 18 may be provided either for varying the direction of the thrust in the horizontal direction or in the vertical plane or in both.

It is also possible to vary the direction of the outflowing gases by displacing the whole of the

propeller owing to a suitable suspension thereof adapted to permit of pivoting it with respect to its normal position.

Such an arrangement should be employed preferably to the shutters or in combination therewith when it is desired to have, for relatively long periods, a direction of the jet making a certain angle with the direction in which the airplane is travelling. For instance, it may be interesting to increase the lift of the airplane by directing in a slightly downward line the air jet from the propeller nozzle. As a matter of fact, the vertical component which results therefrom may be very substantial in comparison with the weight of the airplane, and add itself to the lift of the wings.

This property can be utilized, even when the propeller is not pivotable with respect to the airplane, by giving the outlet of the nozzle a slight downward direction. This direction will depend upon the aerodynamic qualities of the airplane and the section of the wings and the optimum direction will generally differ little from the direction of the wing trailing edge.

As the working of the propeller calls for the suction, from the atmosphere, of a great amount of air, I may take advantage of this for reducing as much as possible the drag of the airplane, by drawing in this air from the points where the surface of the airplane exerts the higher head resistance, for instance along the leading edge of the wing. Fig. 9 shows this arrangement.

Air is admitted along a slot **19** disposed over the whole or a part of the length of the wing and thus penetrates into a channel **20** which leads this air to the inlet of the propelling system. Directing blades may be provided between the slot and the channel or in this channel, so as to reduce as much as possible the resistance of the air circuit.

I may also dispose the discharge nozzles of the propelling system in a position such that they produce an increase of the wing lift. For instance, these nozzles may open along a narrow slot **21** (Fig. 9) running along the whole or a part of the wing span, so as to blow away the limit layer or stratum where it tends to accumulate, which thus produces a lift increase analogous to that obtained by means of a slotted wing but which can be much more important because the available blowing pressure is substantially higher.

The blowing of the limit layer, instead of being made along a single line, can also be made along several lines, in such manner as to avoid, over the whole area of the wing, the accumulation of the limit layer, even for very high angles of incidence of the wing, which makes it possible to obtain a very high lift increase, so that the airplane can be considerably reduced without danger, for instance when taking off or landing.

Such an arrangement is shown by Fig. 9*a*.

Instead of blowing away the limit layer by means of the exhaust of the propelling system, I may also suck it by means of one or several slots provided along the span of the wing and extending over the whole or a part thereof. Such an arrangement is illustrated by ----, Fig. 10. Slots **23** permit of admitting the air into a chamber **20** connected to the inlet of the propelling system.

Finally, according to another arrangement, I send a portion of the exhaust fluid from the propeller into a conduit **24** (Fig. 10) placed along the leading edge of the wing, so as to heat it to avoid freezing thereon. The gases thus utilized escape to the atmosphere through small nozzles working in the same conditions as the main nozzles, and adding their propelling action to that of the whole. Thus the removal of ice on the wings is obtained without loss of efficiency.

These nozzles can also be constituted by slots placed at the wing tips and producing, at these points, a lift increase effect and the desired thrust.

In the preceding description, it has been supposed that the propeller proper is driven by an ordinary engine of the reciprocating type, such for instance as a gasoline engine or a Diesel engine. But this propeller can also, according to the invention, be driven by a motor of any other type, for instance a gas turbine, and, in this case, very interesting combinations can be devised.

Fig. 11 shows a propeller driven by a gas turbine.

The air admitted through the inlet orifice is slowed down in the divergent inlet **2**, then compressed by propeller **3**, which may be of a monocellular or multi-cellular type. In this embodiment, the compressor is shown as including three compression stages, with helicoidal blades and stationary intermediate guiding blades.

When leaving the compressor, the air is heated by one or several burners **31** disposed in one or several combustion chambers. In the embodiment illustrated by the drawing, the combustion chamber **32** is of annular shape and includes a plurality of small burners distributed at equal intervals around its center. When issuing from the combustion chamber, the compressed air is expanded in the nozzles **23** of turbine **34**.

When issuing from the turbine, the air expands again in the propulsion nozzle **4**, in such manner as to assume a high speed v_2 as necessary for ensuring the propulsion of the aircraft. This nozzle may be, as above, provided with shutters for adjusting the outlet section thereof, and also with adjustable deflecting shutters.

It is also possible, by suitably adapting the turbine, to dispense from the second expansion nozzle **4**. It suffices, for this purpose (Fig. 11*bis*) to provide the turbine in such manner that the gases have, at the outlet from the movable wheel, a high residual velocity, of a substantially axial direction. This result is obtained by giving nozzles **33**, same as the set of blades **35** of the removable wheel, sections with very open angles. In this way, the full expansion of the gases takes place in nozzle **33**, a portion of the energy being utilized in wheel **35** and the remainder serving to the propulsion.

When the propeller is driven by a gas turbine, the temperature of the gases issuing therefrom is relatively high and if they are sent directly into the atmosphere, the efficiency may be relatively low in view of the loss of the calories thus evacuated into the atmosphere.

In order to improve the efficiency, it is possible, before expanding the gases, to mix them with a certain amount of air having analogous pressure and velocity. In this way, I reduce the temperature of the mixture delivered into the atmosphere, while increasing the fluid mass. This involves an improvement of the efficiency.

Fig. 12 shows an arrangement in which the air to be mixed with the exhaust gases from the turbine is admitted directly through orifices **36** and compressed merely by its passage through divergent inlet **37**.

After mixture at **38** with the exhaust gases

from the turbine, the whole expands in nozzle 39 before escaping into the atmosphere with velocity v_2. It is clear that this arrangement can be employed only when the expansion ratio in nozzle 39 is relatively low.

In order to obviate this drawback, the heating of the cold air may be effected by means of a surface heater or thermic interchanger, which permits of avoiding mixing said air with the combustion gases issuing from the turbine.

It is also possible, since in this case the gases may have different pressures, to place this interchanger, suitably streamlined, in the hot gas jet after their expansion in nozzle 39.

However, when it is desired to utilize higher expansion ratios, it is necessary to have recourse to an arrangement analogous to that illustrated by Fig. 13.

In this embodiment, the air issuing from propeller 40 is divided into two portions, one of which is further compressed by compressor 41, goes to the combustion chamber shown at 32, where it is heated by burner 31, then expands in gas turbine 34, which is shown of the mono-cellular type, but which might also inslude several stages.

The other portion of the air issuing from compresser 40 passes through a direct conduit 42 which constitutes a by-pass from the gas turbine. Compressor 41 and turbine 34 are devised in such manner that the pressure and velocity of the air and gas which meet together at 43 are substantially equal, whereby the mixture is obtained without loss of energy due to eddies.

The gases at hgh temperature issuing from the turbine heat the relatively cold air coming from the by-pass and the whole is then expanded in nozzle 39, so as to acquire the high speed that is necessary for propulsion.

This arrangement has several advantages. In particular, it is possible, without any drawback, to raise the temperature of the gases produced in the combustion chamber 32 in such manner to improve the efficiency of the gas turbine, and the excessive temperature which results therefrom at the outlet is corrected by suitably increasing the proportion of air passing through the by-pass. On the other hand, the heat lost in the combustion chamber toward the outside is recuperated in by-pass 42, where it cooperates to the heating of the air. It is possible to arrange that the air flowing through the unavoidable leak which exists around the balancing piston 44 of the compressor sweeps the remainder of the surface of the combustion chamber, so that the whole of the lost heat is recuperated. This air may subsequently be returned to the mixing chamber 43, for instance by flowing through the wheel of the turbine at the lower part of the blades, which will have been devised for this purpose.

In Fig. 13, the propeller has been shown in the form of the first stages of a multi-cellular compressor the last stages of which compress only the air portion intended for the turbine, these two parts of the compressor being keyed on the same shaft. But, in view of the different air volumes acted upon by these two parts of the compressor, and also of the different pressures that it is necessary to obtain, it may be advantageous to make the compressor of two distinct bodies turning at different speeds. Such an arrangement is shown by Fig. 14.

The embodiment illustrated by Fig. 14 differs from the preceding one in that compressor 41 which feeds air to the gas turbine is directly driven by said turbine, these two machines being keyed on the same shaft, while propeller 40 which, according to the very principle of the invention, is to rotate at relatively low speed, is driven through a speed reducing gear 45. This gear has been shown in the form of a system of pinions but it might be made of any other form, either conventional or not.

It will be readily understood that, in order to obtain the correct adaptation, both of the propeller and of the compressor of the turbine, when the power, the speed and the height of the airplane vary, it may be necessary to vary the ratio of the outputs supplied by these two machines. This variation can be obtained with machines the speeds of which are always in the same ratio with respect to each other, but it involves a difficulty of the adaptation of the point of operation of each of the machines. This drawback can be obviated by making use of compressors the movable or stationary blades of which can be adjusted and angularly displaced, or having wheels which can be left free to rotate loose on the shaft or sets of stationary blades which can be allowed to turn with the wheels, but it is more advantageous to control the propeller and the compressor so that they run at speeds independent from one another to a certain extent.

This result can be obtained with the arrangement shown by Fig. 15, in which propeller 40 is driven by turbine wheel 46 through shaft 47, while compressor 41 is driven by turbine wheel 48 through hollow shaft 49 concentric to shaft 47. In this arrangement, the gas turbine includes two stages 48 and 46, each of which may be of the single cell or multiple cell type, and through which the gases coming from combustion chamber 32 flow in series.

A particularly advantageous arrangement consists in making use of two turbine wheels 48 and 46 rotating in opposite directions and employing the kinetic energy of the gases expended in the nozzles 50 located immediately ahead of the first wheel, a slight supplementary expansion being eventually effected in the set of stationary guiding blades 51 which is located between the two wheels.

With this arrangement, the efficiency of the turbine can be particularly high because the loss due to the change of direction of the driving fluid in set of blades 51 is greatly reduced. It is even possible to arrange so that the deviation to be effected between the two wheels is practically zero and element 51 can then be wholly dispensed with.

In this drawing, the air issuing from compressor 41 is received in a tore-shaped conduit 52 which communicates, through pipe 53, with combustion chamber 32, whence, after heating by burner 31, it is brought, through conduit 64, to tore-shaped element 55, which feeds it to the nozzles of the gas turbine.

Instead of a single combustion chamber, it is possibly to make use of several chambers, for instance three, which may then be evenly distributed around the axis of the machine, each including the pipes 53 and 54 for the air inflow and the gas outflow and eventually further including one or several burners.

The portion of the air which does not pass through the gas turbine is derived through bypass 42 and is added, in mixing chamber 43, to the exhaust gases of the turbine, which heat this air. The gaseous mixture is then expanded in

nozzle 39 before being evacuated to the atmosphere.

In the case of the propeller being driven by a gas turbine, it is clear that it is also possible, as above stated, to heat the air flowing through the by-pass by means of one or several burners into which a supplementary amount of fuel is sent, in order to be able to obtain temporarily a higher power while slightly lowering the efficiency during this period.

Of course, nozzle 39, same as inlet orifice 1, can be divided in such manner as to constitute several nozzles working in parallel and of any suitable shape or section. For instance, the nozzles may be of circular or rectangular section or of very flat shape. They may be provided either at the rear or on the sides of the engine nacelles or of the fuselage or of the wings, several of these arrangements having been indicated above by way of example.

Likewise, in the propeller driven by a gas turbine, the movable and stationary blades of the propeller and of the compressor can be adapted to be angularly displaced, either for the whole of the machine or by wheels or groups of wheels, as indicated for the case of propellers driven by ordinary reciprocation movement engines.

The starting of propelling systems including an engine of this last mentioned type involves no difficulty other than those indicated for operation on the ground level in the case of the system being adapted to working at high altitude. Concerning the case of propellers driven by gas turbines, a special device or method must be provided for starting the system. Such a device is easy to provide. For instance, I provide a small starting engine (as shown at 64 in Fig. 12) driving the gas turbine for starting it and adapted to be subsequently disconnected.

I may also send into the combustion chamber air coming from a battery of compressed air bottles and suitably expanded. This air is then heated by the burners which are thus allowed to start burning and it permits the starting of the gas turbine and therefore that of its compressor. At this time, I might dispense with the compressed air bottles, which might be left on the ground, the airplane being kept stationary during the starting of the turbine-compressor unit.

Another solution, which has great advantages of simplicity and quickness, consists in effecting the starting of the propeller by blowing through orifice 1 compressed air from a motor-fan system placed on a motor car and provided with a flexible or angularly displacement pipe adapted to fit on inlet 1, the airplane being kept stationary during operation.

The air flow thus produced in the propelling system permits of starting burners 31 and the gas turbine which then supplies the power necessary for the drive of the compressor or compressors. The acceleration of this turbine is then easily and quickly obtained by the adjustment of the amount of fuel and the motor car carrying the auxiliary fan can then move away so as to permit the take off of the airplane.

I may also constitute a mixed propelling system including both a reciprocating movement engine and a gas turbine.

Fig. 16 shows an arrangement of this kind. In this drawing, the reciprocating motion engine 12 drives compressor 56, which discharges air to the combustion chamber 57, where air is heated by burner 58. This combustion chamber may also receive the exhaust gases from engine 12, which may itself be supercharged by a portion of the air supplied by compressor 56.

The hot gases coming from combustion chamber 57 are sent to gas turbine 59 which, owing to the heating of the gases, is capable of supplying a power substantially higher than that of engine 12. This turbine in turn drives compressor 60, according to the invention.

The air from the atmosphere which penetrates through orifice 1 is compressed by propeller 60, mixes at 61 with the exhaust gases from the turbine and the whole is expanded by nozzle 39 before being evacuated to the atmosphere for propelling the airplane. This arrangement is particularly advantageous for instance in the case of a twin engine airplane in which the reciprocating motion engine or engines 12, which must be supervised, can be placed in an accessible portion of the airplane, for instance in the fuselage, while the propellers proper can be placed on the outside, either in separate nacelles or in the thickness of the wings.

Besides, it should be noted that the various types of propelling systems above described are particularly well adapted to the most varied embodiments of airplanes and can be employed either in the fuselage or in separate nacelles, or again in the thickness of the wings or ahead of them.

By way of example, Figs. 17 and 18 show, in vertical section and in plan view respectively, a four-engined airplane of the type called "flying wing," in which the four propelling systems 61 are placed so as to project slightly at the front of the wing and each discharge fluid streams through a slot-shaped nozzle located on the upper side of the wing at the point where an accumulation of the limit layer tends to occur.

The four nozzles thus constituted are of a size such that they adjoin one another so as to create over the whole span of the wing, a lift increase device acting by blowing off the limit layer, in addition to the desired thrust.

In Fig. 17, 1 is the inlet orifice leading to propeller 40, 62 designates one of the four engines driving the propellers, 63 is the slot-shaped nozzle for the expansion of the gases in order to obtain propulsion.

RENÉ ANXIONNEZ.
ROGERT IMBERT.

PUBLISHED | R. ANXIONNAZ ET AL | Serial No.
MAY 25, 1943. | REACTION PROPELLING DEVICE FOR AIRCRAFTS | 367,666
BY A. P. C. | Filed Nov. 28, 1940 | 6 Sheets-Sheet 1

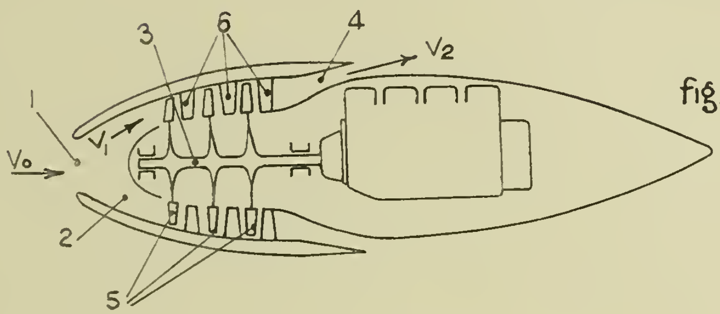


fig. 1

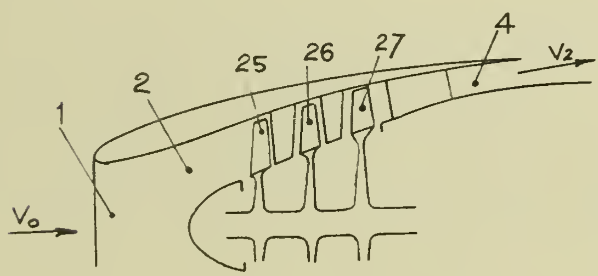


fig. 2

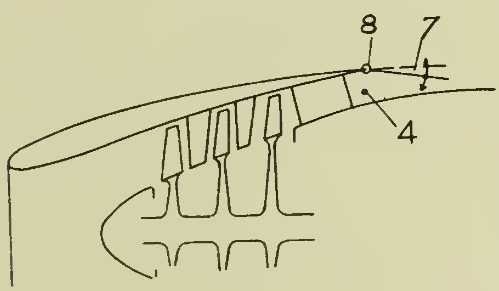


fig. 3

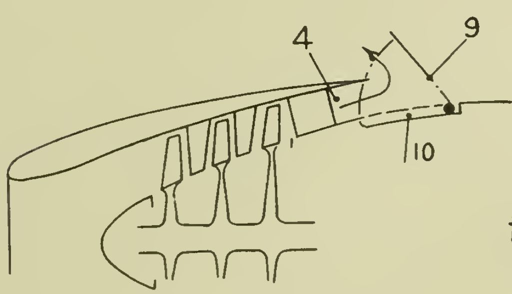


fig. 4

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. ANXIONNAZ ET AL

REACTION PROPELLING DEVICE FOR AIRCRAFTS

Filed Nov. 28, 1940

Serial No. 367,666

6 Sheets-Sheet 2

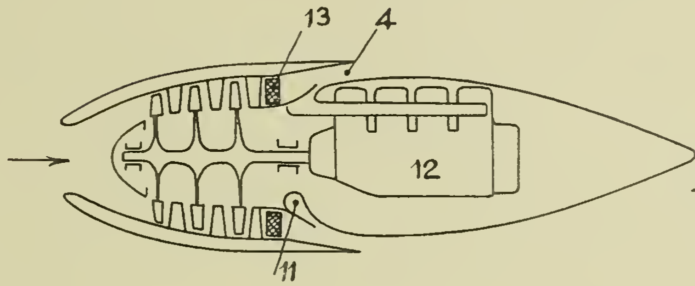


fig. 5

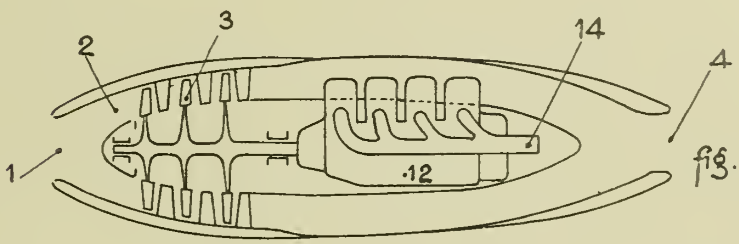


fig. 6

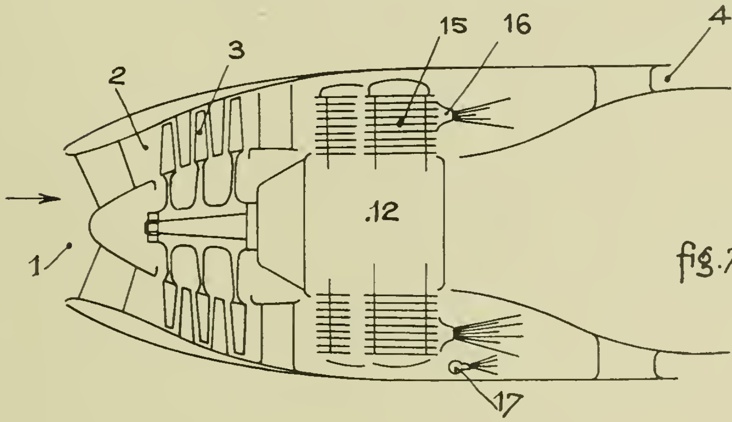


fig. 7

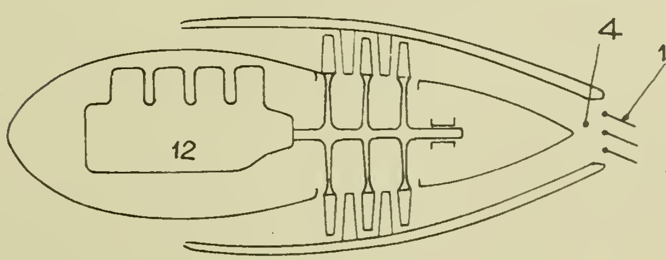


fig 8

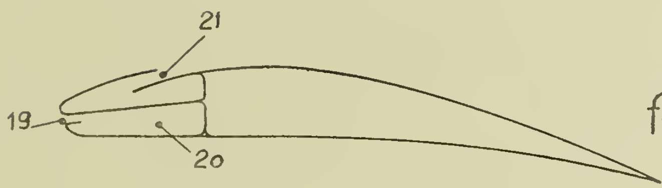


fig. 9

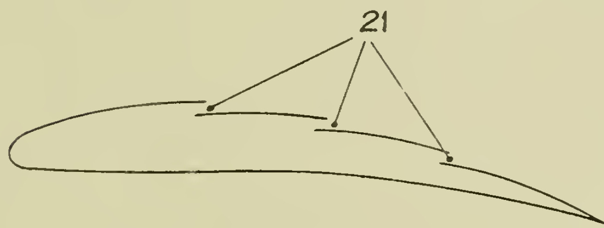


fig 9a

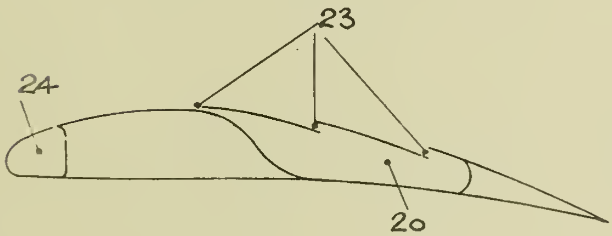


fig 10

PUBLISHED MAY 25, 1943. BY A. P. C.

R. ANXIONNAZ ET AL

REACTION PROPELLING DEVICE FOR AIRCRAFTS

Filed Nov. 28, 1940

Serial No. 367,666

6 Sheets-Sheet 4

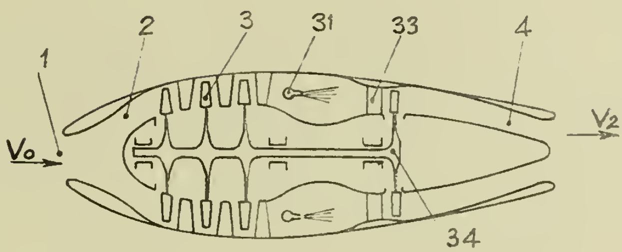


fig.11

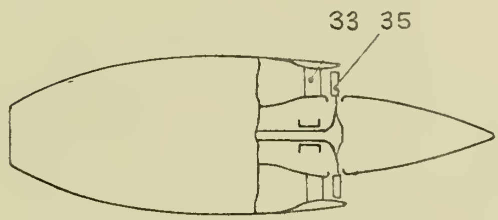


fig.11 bis

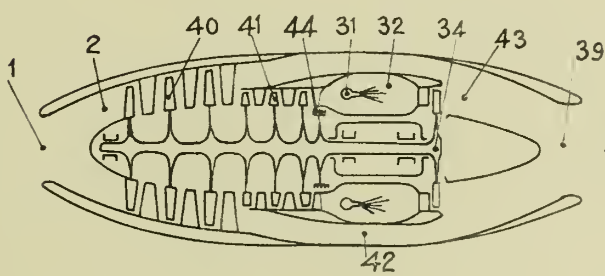


fig.13

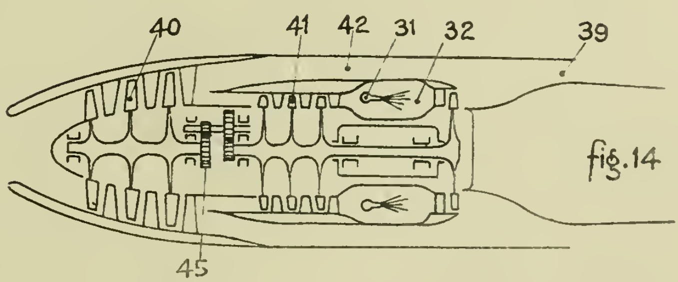


fig.14

PUBLISHED	R. ANXIONNAZ ET AL	Serial No.
MAY 25, 1943.	REACTION PROPELLING DEVICE FOR AIRCRAFTS	367,666
BY A. P. C.	Filed Nov. 28, 1940	6 Sheets-Sheet 5

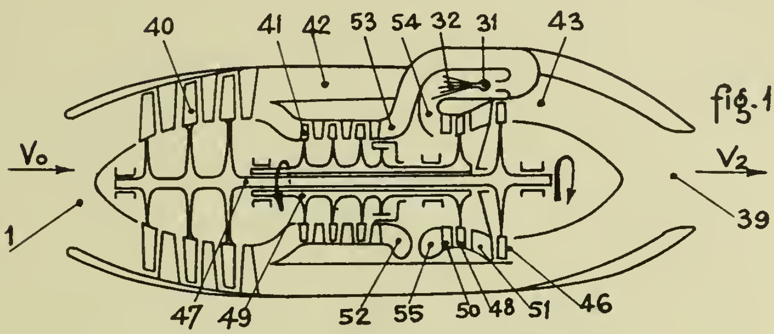


fig. 15

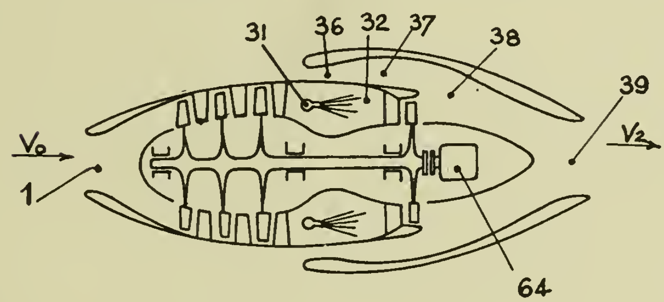


fig. 12

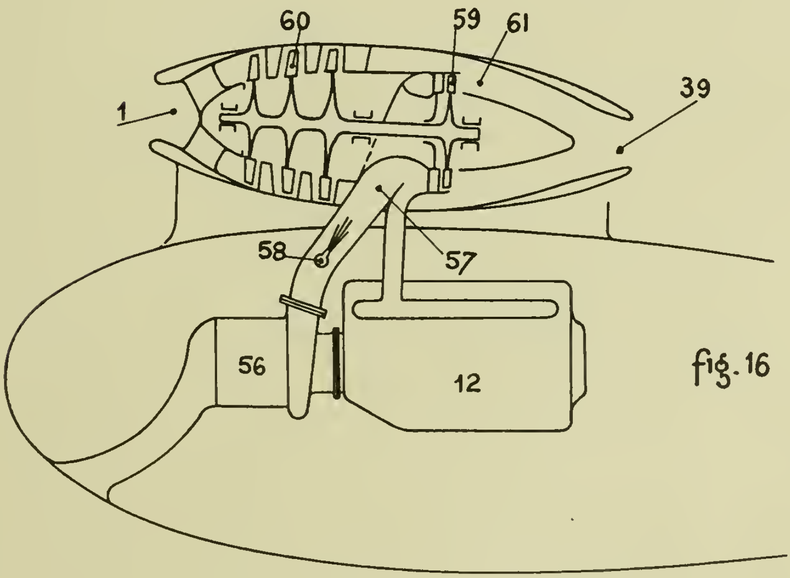


fig. 16

PUBLISHED R. ANXIONNAZ ET AL Serial No.

MAY 25, 1943. REACTION PROPELLING DEVICE FOR AIRCRAFTS 367,666

BY A. P. C. Filed Nov. 28, 1940 6 Sheets—Sheet 6

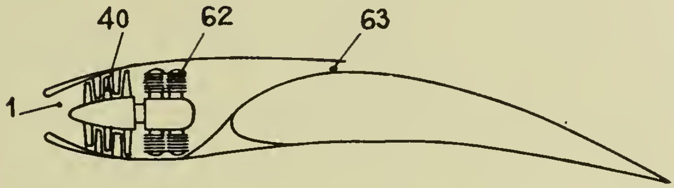


fig. 17

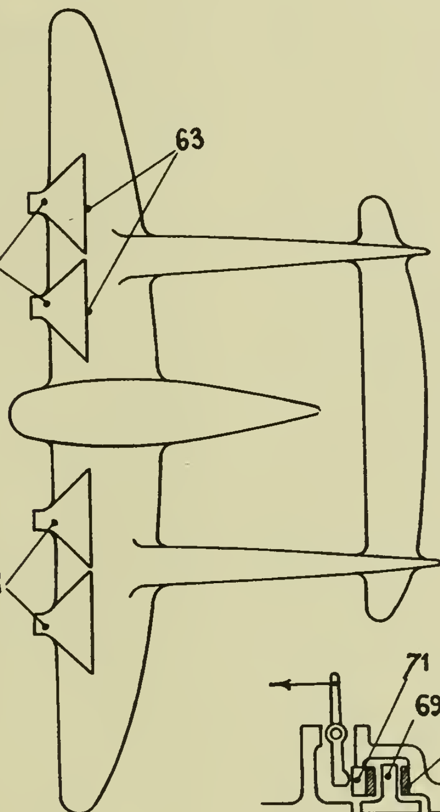


fig. 18

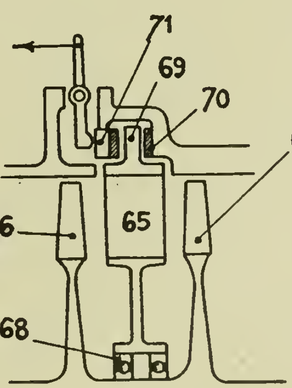


fig 3 a

Published May 25, 1943 Serial No. 368,050

ALIEN PROPERTY CUSTODIAN

APPARATUS FOR MIXING, SIFTING AND KNEADING

Paul Vollrath, Koln am Rhein, Germany; vested in the Alien Property Custodian

Application filed November 30, 1940

The invention relates to an apparatus for mixing, sifting and kneading of liquid, semi-liquid, pasty, pulverous or dry material with mixing-, sifting- or kneading-tool arranged above a stationary or movable trough, the driving shaft of which tool is arranged eccentrically to the central axis of the trough in a jib-arm oscillatable about a vertical shaft. In apparatus of this kind, for instance planet-stirring apparatus, the mixing tool carries out a circulating movement about the vertical shaft of the jib-arm with the result that a very good and thorough mixing-, sifting- or kneading-effect is produced.

The object of the invention is, to further improve, in apparatus of this type, the mixing effect and to thereby save time, power and money. This is effected chiefly thereby that the jib-arm carrying the tool consists of two hingedly connected parts, and that both arm parts are connected the one with the other or with the central shaft independently on the arrangement of the drive of the tool shaft from the central shaft, shaft with joint or the tool shaft by ratchet-wheels and pawls, planet wheels or similar devices, so that, owing to the resistance of the rotating tool in the material to be treated, a stepwise or continuous turning movement of the inner part of the jib-arm is produced or the movement of the same is locked. In machines for the wet dressing of ores, in which air in as fine distribution as possible is blown through the mixture of ore and water, it is known to employ, for blowing-in the air, nozzles arranged eccentrically to the vertical revolvable shafts, so that owing to the recoil of the blown out air the nozzles rotate about their vertical shafts, and this turning movement is transmitted by means of spur wheels and sprocket wheels onto a common vertical central shaft, in order to produce in this manner a planet-like circulating movement of the nozzles always progressing in the same direction. The idea is not realized hereby to produce a quite special mixing-, sifting- or kneading effect in a mixing-, sifting- and kneading-machine by combination of two different kinds of movement.

According to the invention the driving motor may be mounted on the tool shaft or on the shaft with joint or on the middle shaft, the drive of the tool being effected in the two last mentioned possibilities by chains or equivalent means. The outer arm part and a spur wheel may be fixed on the shaft with joint of the bipartite arm, and this spur wheel mesh with a spur wheel on the bearing of the inner arm part. For the obtention of different movements of the tool the spur wheel mounted on the shaft with joint of the bipartite arm may be adapted to be selectively coupled with the shaft or with the bearing body of the same.

Several embodiments of the invention are illustrated by way of example in the accompanying drawing, in which

Fig. 1 shows a vertical section through a mixing apparatus,

Fig. 2 a section on line *a*—*a* of Fig. 1.

Figs. 3 to 8 diagrammatical illustrations of the individual elements and of the occurring forces,

Fig. 9 another form of construction according to the invention,

Fig. 10 a section on line *b*—*b* of Fig. 9,

Fig. 11 a second modification,

Fig. 12 a third modifiation,

Fig. 13 a section on *c*—*c* of Fig. 12.

In all forms of construction of the invention the mixing trough is designated by **14** and the shaft of the mixing tool, which may be different according to the problem to be solved, is designated by **15**.

In the form of construction shown in Fig. 1 a central shaft **20** is revolvably mounted either on a bow **16** extending over the trough **14** or on a jib arm **17** which is adjustable in vertical direction along an upright **18**, an arm **21** being keyed onto the central shaft **20** which is located in a bearing sleeve **19**. This arm **21** carries at its front end a shaft **23** with joint revolvable in a bearing sleeve **22**, on the lower end of which shaft with joint a second arm **24** is keyed and carries on its free end a driving motor **25** for the tool shaft **15**. Current is supplied to the motor **25** by sliding contacts **26** and **27**. On the bearing sleeve **19** a ratchet-wheel **28** is keyed which cooperates with two pawls **29** and **30** acting in different directions.

In the form of construction shown in Fig. 9 a spur wheel **31** is arranged on the bearing sleeve **19** instead of the ratchet-wheel with pawls, said spur wheel **31** meshing with a spur wheel **32** keyed on the hinge shaft **23**. By clutch devices not shown and of known type, the spur wheel **32** can be coupled either with the hinge shaft **23** or with the bearing sleeve **22** of the same.

In the form of construction shown in Fig. 11 the driving motor **25** is mounted on the arm **21** and drives the hinge shaft **23**. On the lower end of shaft **23** a sprocket wheel **33** is keyed, which drives by means of a chain **34** a sprocket wheel **35** keyed on the tool shaft **15** and through the same the shaft **15**.

In the form of construction shown in Fig. 12 the driving motor 25 is mounted on the bow 16 and drives the central shaft 20.

On the hinge shaft 23 a bush 36 is mounted so that it can loosely turn about this shaft and is equipped with two sprocket wheels 37, 38. The sprocket wheel 37 is driven by means of a chain 39 from a sprocket wheel 40 mounted on the central shaft 20, whereas the sprocket wheel 38 drives by means of a chain 41 a sprocket wheel 42 keyed on the tool shaft 15 and thus this shaft 15 itself. Evidently, instead of the chain gears any other means for transmitting power may be employed in the last mentioned embodiments of the invention. The form of construction shown in Fig. 1 with jib arm 17 and upright 18 may also be employed in the other embodiments of the invention.

In all forms of construction the arms 21 and 24 may be adjustable in length and adapted to be locked by any suitable known means, it being then necessary, in so far as positively cooperating driving elements are provided, to make the same exchangeable.

The operation is diagrammatically shown by Figs. 3 to 8, which especially relate to the embodiment shown in Figs. 1 and 2.

Suppose, the individual elements assume the position shown in Fig. 3, in which the inner arm 21 and the outer arm 24 are in alignment. If then the tool turns about its shaft 15 in the direction of the arrow, a reaction effect will be produced, owing to the unequal resistance encountered by the mixing tool, related to the bolt 23 as fulcrum, in the material to be mixed, which reaction effect tends to oscillate the arm 24 in the direction of the arrow 43, whereas at the same time an oppositely directed force acts in the direction of the arrow 44 onto the hinge shaft 23. Herefrom results, that the outer arm 24 is oscillated in clockwise direction about the hinge shaft 23 and the inner arm 21 in anti-clockwise direction about the central shaft 20. The individual elements assume therefore now the position indicated in Fig. 4, the force acting in the direction of the arrow 44 being decomposed into the two components 45 and 46 and only a smaller force tends to turn the inner arm 21 in anti-clockwise direction. If finally the elements assume the position shown in Fig. 5, the component 46 disappears completely and the inner arm part 21 comes to standstill, whereas the outer arm 24 continues its oscillating movement in clockwise direction.

If there were no locking device provided, a component 47 would occur at further rotating of the outer arm 24, said component tending to oscillate the inner arm 21 in opposite direction, i. e. also in clockwise direction. As, however, the locking device 28, 29, 30 only admits of a rotation in the one direction, and as this device is usually engaged, the inner arm 21 remains at standstill until the position shown in Fig. 7 has been passed and then again a component 46 occurs, which tends to oscillate the inner arm 21 in anti-clockwise direction. Whilst therefore, the outer arm 24 circulates continually with the mixing tool, there always occurs an interruption of the circulating of the inner arm 21, so that this arm rotates only stepwise and, according to which one of the two pawls 29 or 30 is engaged, either in the one or the other direction. If, however, both pawls are engaged, the inner arm part 21 cannot oscillate in any direction and the tool circulates merely about the shaft 23. Consequently it is possible to work also with smaller troughs as indicated at 51.

Accurately the same manner of operation takes place in the form of construction shown in Fig. 11, whereas in the forms of construction shown in Figs. 9, 12 a difference can be noted in so far as the rotating movement produced by the reaction effect of the mixing tool is utilized to produce a planet movement with the aid of spur wheels, so that in this instance the circular movement is a continuous one always in the same direction and dependent on the revolving direction of the tool shaft 15. Also in the forms of construction shown in Figs. 9 and 12 a modification may be obtained, in that the spur wheel 32, instead with the hinge shaft 23, is coupled with the bearing casing 20 of the same so that thereby the arm 21 remains at standstill.

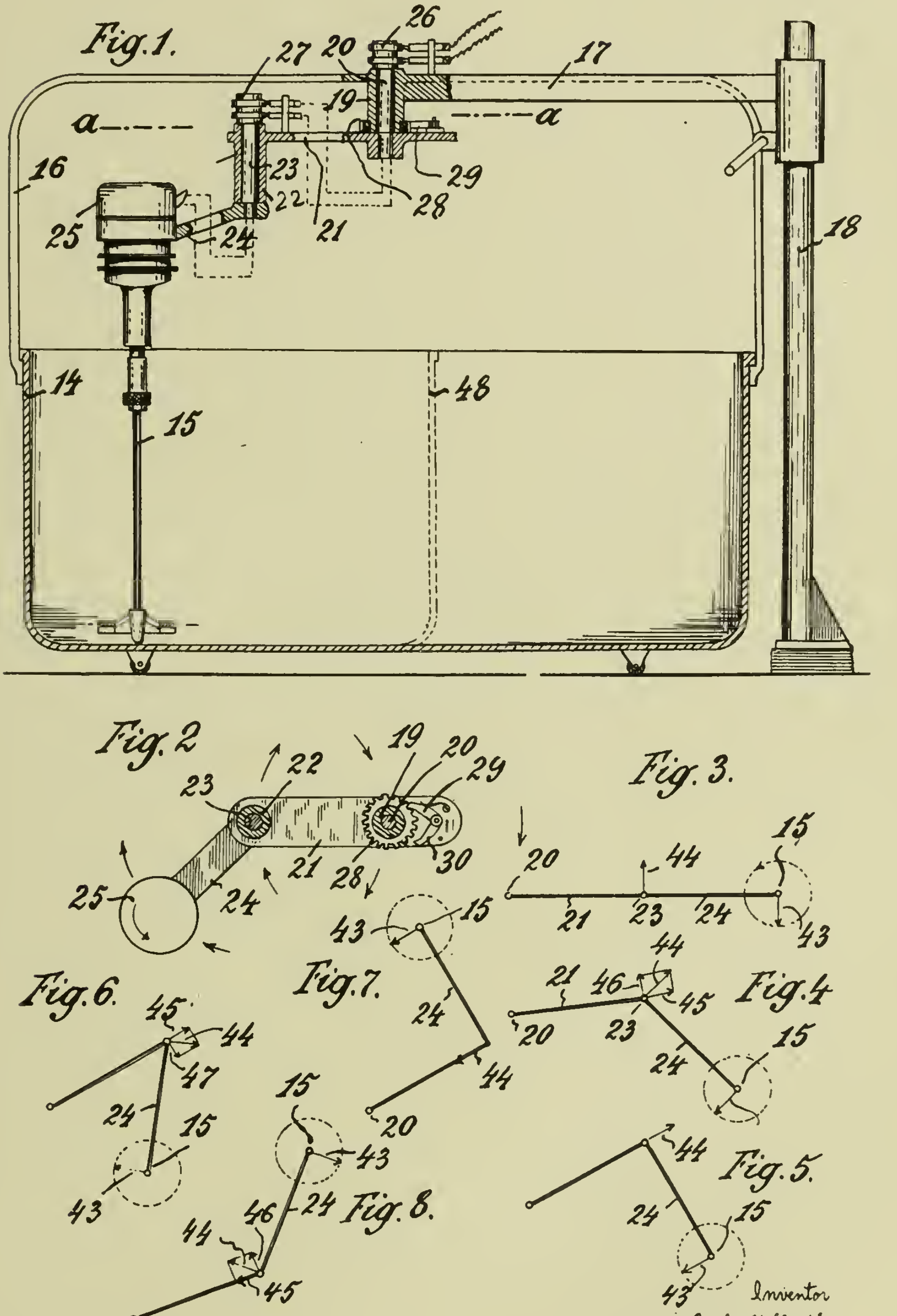
Whether the drive of the tool shaft 15 takes place directly as shown in Figs. 1 and 9 or indirectly as shown in Figs. 11, and 12 does not alter the operation in the least, as in any case a reaction effect occurs by the movement of the mixing tool in the material to be mixed and has the tendency to produce a circulating movement of the tool whereby then further automatically the movements must take place owing to the new arrangements. If the arms 21 and 24 are locked the one relative to the other, the whole arrangement rotates about the central shaft 20, which under certain circumstances may be desirable, same as the complete exclusion of a rotary movement, as soon as, the arms 21, 24 being locked the one relative to the other, the arm 21 is further locked relative to its bearing 19.

PAUL VOLLRATH.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

P. VOLLRATH
APPARATUS FOR MIXING, SIFTING AND KNEADING
Filed Nov. 30, 1940

Serial No.
368,050
3 Sheets-Sheet 1

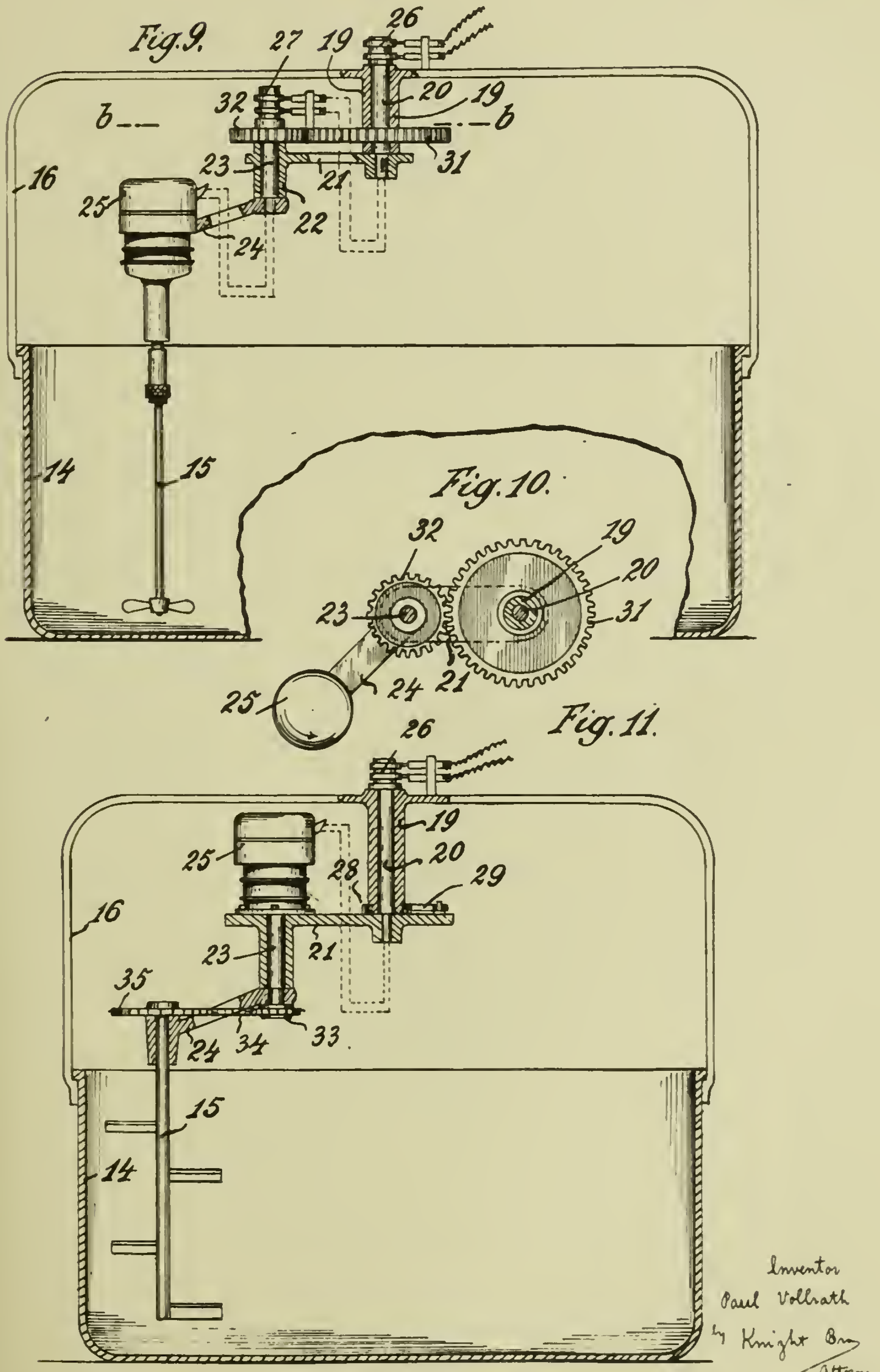


Inventor
Paul Vollrath
by Knight Bros
Attorneys

PUBLISHED
MAY 25, 1943.
BY A. P. C.

P. VOLLRATH
APPARATUS FOR MIXING, SIFTING AND KNEADING
Filed Nov. 30, 1940

Serial No.
368,050
3 Sheets-Sheet 2



PUBLISHED

MAY 25, 1943.

BY A. P. C.

P. VOLLRATH

APPARATUS FOR MIXING, SIFTING AND KNEADING

Filed Nov. 30, 1940

Serial No. 368,050

3 Sheets-Sheet 3

Fig. 12.

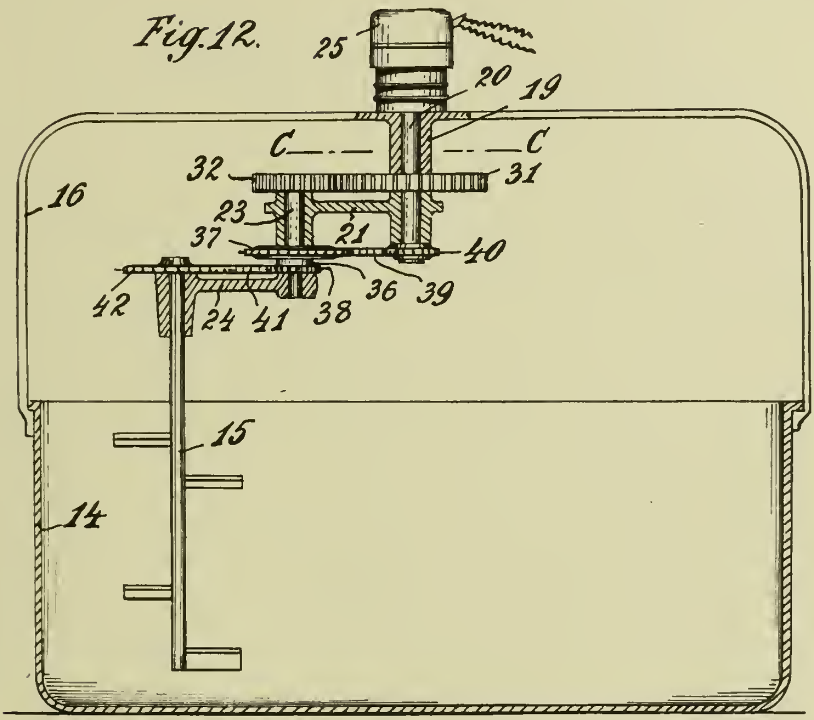
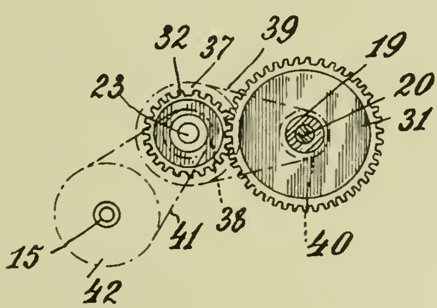


Fig. 13.



Inventor
Paul Vollrath
by Knight Bros
Attorneys

Published May 25, 1943 Serial No. 368,292

ALIEN PROPERTY CUSTODIAN

DISENGAGEABLE CONNECTION, ESPECIALLY OF TWO CONICAL RUBBER-METAL BUSHINGS

Béla Barényi, Boblingen, Germany; vested in the Alien Property Custodian

Application filed December 3, 1940

The present invention relates to disengageable connections and more particularly refers to devices adapted to disengageably connect two conical rubber-metal bushings.

Devices for connecting together two portions are well known in which an internal and an external portion together with interposed cylindrical or conical rubber bushings resiliently are borne against each other. For instance such resilient bearings have been provided for connecting aggregates of axes of motor vehicles to the frame of the latter.

Now, the present invention relates to disengageable connections for connecting two axially arranged conical rubber-metal bushings, particularly bushings surrounded by tubes, and substantially consists therein that the two sleeves are provided with oppositely directed threads and held together by a turnbuckle having corresponding threads. In a simple manner it is hereby rendered possible to insert both rubber-metal bushings into the surrounding or enclosing tube from the ends thereof and to bring the ends of the bushings in the correct position with regard to each other by tightening the turnbuckle. The two outer metal sleeves may be extended for this purpose beyond the rubber bushings and to each other and provided at their extended ends with oppositely directed internal threads for receiving the turnbuckle adapted to be screwed into same. For the purpose of introducing a tool for tightening the trunbuckle, the casing, for instance the tube-like casing, supporting the rubber-metal bushings preferably is provided with corresponding slot-like openings, at least one such opening.

In the accompanying drawing one construction according to the invention is shown by way of example.

In this drawing:

Fig. 1 is a longitudinal section through a connection according to the invention, and

Fig. 2 is a cross section through the connection shown in Fig. 1.

A shaft or tube *b* indicated in dish- and dotted lines in Fig. 1 is to be elastically journalled in an external tube-like casing *a*. The two conical rubber bushings *c* are used for the connection, the smaller diameters of which are directed against each other so that they are particularly adapted to elastically absorb axially directed forces. Each of the sleeve-like rubber buffers is provided externally with a metal sleeve *d* and internally with a metal sleeve *e* connected for instance by vulcanisation or by sticking. The ends of the metal sleeves *d* facing each other are extended and provided with internal threads *f*, one of the sleeves being provided with a right-hand thread and the other with a left-hand thread. Between the two internal sleeves *e*, a distance sleeve *g* is arranged. For connecting the two external metal sleeves *d*, a turnbuckle *h* is provided according to the invention the outer surface of which carries right-hand and left-hand threads corresponding to the threads *f*.

To position the rubber sleeves in place, first the distance sleeve *g* and the turnbuckle *h* are axially introduced into the tube-like casing *a* from the side thereof. Thereupon the two rubber bushings *c* together with their metal sleeves *d* and *e* are introduced from both sides into the casing until they engage the threads *f* of the turnbuckle *h*. For tightening the turnbuckle a tool, for instance a bolt *i*, is then introduced through a slot-like opening *k*, provided for this purpose in the casing *a*, and is brought into engagement with two oppositely arranged bores *l* in the turnbuckle *h*, the bolt *i* simultaneously being passed through slots *m* provided in the distance sleeve *g*. By turning the tool *i* in the direction of the arrow *o* and by repeated insertion of the tool *i* into the next following opening *l*, the turnbuckle *h* is turned or screwed until the two conical metal sleeves *d* firmly bear against the corresponding conical surfaces of the tube-like casing *a*.

On tightening of the turnbuckle the rubber-metal bushings preferably are prevented from rotating relatively to the casing *a*. Such locking of course may also remain effective after tightening of the turnbuckle.

The present invention renders superfluous space requiring screw devices at the ends of the rubber-metal bushings, as the connection of the bushings or the securing of the same in the casing respectively is effected in the space present in any case between the two rubber bushings *c*.

Instead of connecting the two external sleeves *d* by the turnbuckle *h*, a turnbuckle for the internal metal sleeves *e* may be provided in a similar manner. The turnbuckle *h* in this case preferably is to be provided with internal threads.

In both cases it is principally possible to use as well internal as external threads.

When used for the resilient suspension of the axis of motor vehicles, the casing *a* may for instance be connected to the frame of the vehicle and the shaft *b* for instance to a supporting member for suspending the wheel. The arrangement may be chosen that the axis of the rubber bushings extends in a horizontal, a vertical or any desired other direction.

BÉLA BARÉNYI.

PUBLISHED

MAY 25, 1943

BY A. P. C.

B. BARÉNYI

DISENGAGEABLE CONNECTION, ESPECIALLY OF TWO CONICAL RUBBER-METAL BUSHINGS

Filed Dec. 3, 1940

Serial No. 368,292

Fig. 2.

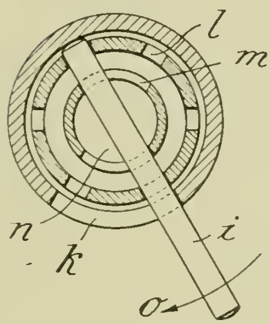
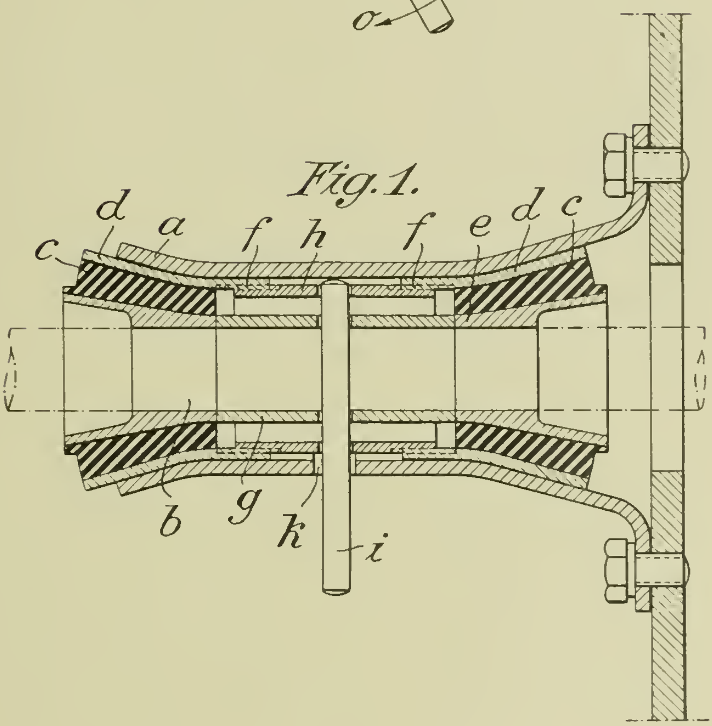


Fig. 1.



INVENTOR

BÉLA BARÉNYI

BY

Haseltine, Lake & Co.

ATTORNEYS

Published May 25, 1943

Serial No. 368,491

ALIEN PROPERTY CUSTODIAN

REVERSIBLE VALVE FOR A PUMP

Toranosuke Ohno, Azabu-ku, Tokyo, Japan; vested in the Alien Property Custodian

Application filed December 4, 1940

This invention relates to a reversible valve for a pump, which comprises fitting a valve body into a casing in such a manner as can be rotated freely by a handle, the said valve body being formed by connecting a pair of discs by a partition wall, providing a cylindrical tube which pierces the said partition wall in the midway between the discs, one of which has a perforation and also providing a bent pipe open in the said disc; and connecting the hollow part of a supporting leg and outlet of the valve casing to the discharge and suction ports of a pump respectively; causing the opening of the valve casing on the liquid receiving side to communicate with the discharge port of the pump by means of the above cylindrical tube of the valve body when liquid is to be fed and also making the said bent pipe of the valve body communicate with the suction port of the pump through the said outlet of the valve casing, while, when the liquid is to be discharged, the opening of the valve casing on the side where the liquid is discharged is caused to communicate with the suction port of the pump by one of the compartments separated by the partition wall of the valve body and the discharge port of the pump is connected with the discharge port of the valve casing by the other compartment. The object thereof is to obtain a reliable reversible valve for a pump which can discharge and supply liquid very simply by only shifting and adjusting a single valve body in the casing to the right and left by the handle.

Hitherto, to replace the liquid in a container by fresh one by connecting a pump and the container by a conduit, several valves have been used and opened and closed selectively in a certain order. But such selective opening and closing operations are so complicated that an error is often committed in the order, resulting in an unforeseen accident. Moreover, because of the use of several valves, the connection is complicated to the great inconvenience in handling. According to the present invention, the replacement of the liquid may be made very simply by using a single reversible valve and that without any apprehension of wrong operation.

Referring to the accompanying drawing which shows the manner of performing this invention,

Figure 1, is a front view partly cut off of the reversible valve according to the present invention;

Figure 2, a perspective view of the valve body;

Figure 3, a side view of a pump fitted with this reversible valve;

Figure 4, a section showing the relative position of the valve casing and valve body and the course of the liquid to be discharged;

Figure 5, a section illustrating the relative position of the valve casing and valve body and the course of the liquid to be supplied and

Figure 6, a section illustrating the relative position of the valve casing and valve body and the course of the liquid to be circulated only in the pump.

As shown in Figure 1, the reversible valve of this invention consists of a special casing A and valve body B. The inner hollow wall 1 of the casing B has a truncated cone shape and a flanged cover 3 is fitted to an open end 2 of large caliber. An end wall 4 of a reduced diameter and the periphery 6 of the valve casing are provided with openings 5 and 7 respectively to allow liquid to go in and out. A periphery 6′ opposite the opening 7 has a perforation 8 communicate with the inner hollow part 10 of a supporting leg 9. If this reversible valve is disposed on a pump P by said supporting leg as shown in Figure 3, communicates through its perforation 8 and hollow part 10 of the leg 9 with the discharge port 11 of the pump. A flow-out port 12 formed between the opening 7 and perforation 8 is connected with the suction port 14 of the pump P by a connecting pipe 13 as shown in Figure 3.

The valve body B fitted in the casing A as in Figure 1 is formed in the following manner as is clear from Figure 2. A pair of discs 15 and 16 of different diameters are connected by a partition wall 17 and a cylindrical tube 29 which pierces the said partition wall is provided between the discs 15 and 16. A bent tube 18 which opens at 30 on the disc 15 opens at 19 in the direction of a right angle to the axial line of the cylindrical tube 29. The disc 15 has a perforation 20, while the disc 16 is provided with an operating shaft 21 to which a handle 22 is fixed to rotate the valve body B, the said handle 22 being equipped with a pointer 23 to indicate whether the valve body B is in an oil discharging, feeding or stopping condition.

To explain the operation of this invention, the conduit 24 connected with the opening 7 of the valve casing A is inserted into any desired liquid container, for example, an oil tank of a transformer on a pole (not shown) and a conduit 31 is connected to an empty container. Next, the handle 22 is adjusted to the oil discharging position O shown in Figure 3, and the valve body B is set at the position indicated in Figure 4 with regard to the casing A. Operate the pump P

means of the handle 25, and then the pump will suck in the oil in the tank through its port 14, so that the oil in the transformer casing reaches the empty container through the conduit 24 from the entrance 7 of the casing A, and passing a compartment 26 around the other periphery of the cylindrical tube 29 and then through the flow-out port 12, the connecting pipe 13, the suction port 14 of the pump, the pump P, the inner hollow part 10 of the supporting leg, the perforation 8, a valve casing compartment 27, the perforation 20, a valve casing chamber 28 and discharge port 5, it is discharged from a conduit 31. Thus, it is possible to draw out the whole transformer oil from the tank.

To feed fresh oil to the tank thus made empty, a conduit 31 is dipped into an oil source. Next, after shifting the handle 22 to the oil feeding position I and adjusting the valve body B to the position shown in Figure 5, operate the pump P as before, and it will display sucking action at the suction port 14, so that the fresh oil is drawn thereinto through the conduit 31, valve casing chamber 28, opening 30, bent tube 18, flow-out port 12, connecting pipe 13 and suction port 14 from the oil source. Then, passing through the hollow part 10 of the supporting leg of the casing A, perforation 8, cylindrical tube 29, port 7 and connecting pipe 24, it will be fed to the tank. Further, if the handle 22 is operated to set its pointer 23 at the position indicated by S in Figure 3, the relative position of the valve casing A and valve body B will have the condition as shown in Figure 6, so that even if the handle 25 of the pump P is operated, the fluid will only flow circulately through the flow out port 12, connecting pipe 13, suction port 14, pump P, inner hollow part 10, perforation 8 and compartment 26 of the valve casing. Consequently, the valve will display a stopping function without the transformer oil being discharged or charged.

As explained above, according to the present invention only one reversible valve is used, and by simply rocking its operating handle to the right and left it is possible with the same conduit to replace the oil and other kinds of liquids in a tank. The invention has the further advantage of being very reliable in operation.

The above is an explanation of the case where the oil of the pole transformer is changed or discharged, but it is needless to say that this invention is also applicable broadly to fire pumps, gasoline pumps, etc. when a fluid is to be supplied to a tank or drawn out from it.

TORANOSUKE OHNO.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

T. OHNO

REVERSIBLE VALVE FOR A PUMP

Filed Dec. 4, 1940

Serial No.

368,491

Fig. 1.

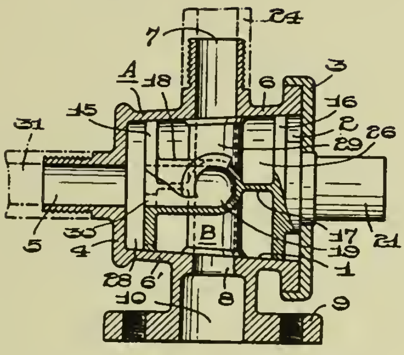


Fig. 4.

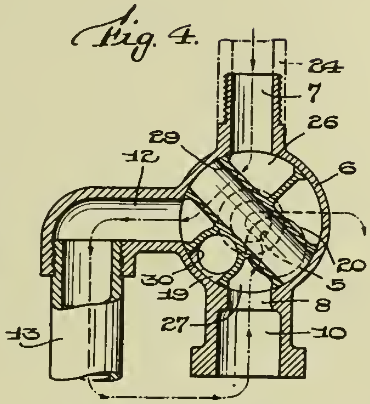


Fig. 2.

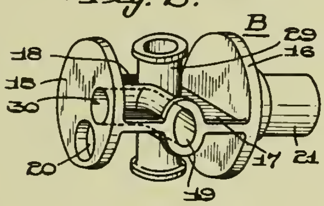


Fig. 5.

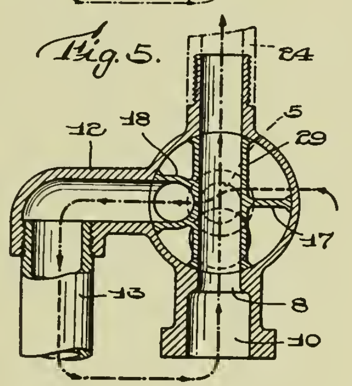


Fig. 3.

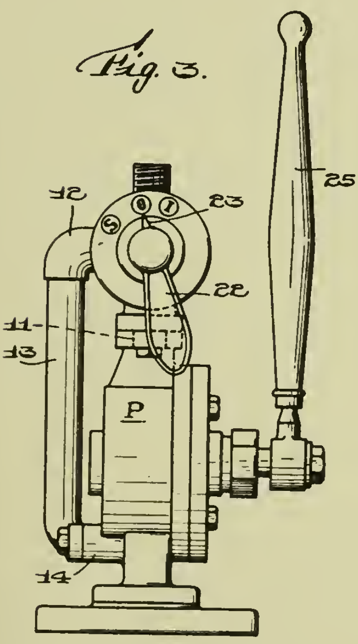
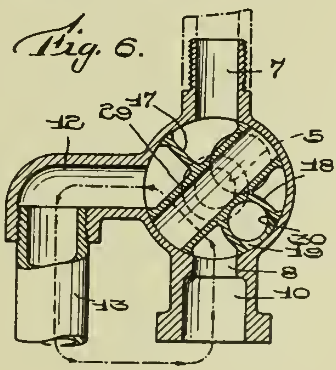


Fig. 6.



INVENTOR:
TORANOSUKE OHNO
BY
Haseltine, Lake & Co.
ATTORNEYS.

ALIEN PROPERTY CUSTODIAN

CHASSIS FOR MOTOR VEHICLES SUBDIVIDED INTO A PLURALITY OF LONGITUDINAL SECTIONS

Béla Barényi, Boblingen, and Karl Wilfert, Sindelfingen, Germany; vested in the Alien Property Custodian

Application filed December 5, 1940

The present invention relates to motor vehicles subdivided into a plurality of longitudinal sections, preferably three of them. More particularly the invention is concerned with a chassis for a vehicle of the kind described to the middle section of which two end sections each carrying an aggregate of axis are attached.

Motor vehicles of this kind are known in which the chassis as well as the carriage body are subdivided into sections. In this case, the fastening of the individual sections together must be effected at the frame as well as at the carriage body to obtain a sufficient rigidity at the points of connection. In connection with a frame, carrying the aggregates of the front- and the rear axis, it is also known to produce the carriage body in sections and to fit same later upon the frame, whereby the sections of the carriage body may be connected to the frame as well as to each other. This type of frame and carriage body, however, does not show the advantageous manner of manufacture consisting in making completely separated vehicle sections.

Moreover, a vehicle consisting of three sections has already been proposed in which the middle portion has a reinforced roof construction, the ends of the carriers carrying the roof being bent downwardly and serve to connect the middle section to the end sections of the vehicle. This construction, however, offers practical difficulties, because for constructional reasons the roof carriers can not be made sufficiently rigid or the ordinary hood constructions must be given up. Moreover, the internal space is in an undesired and unsuitable manner hindered in the height of the head and the centre of gravity of the vehicle is raised.

All these drawbacks are obviated in accordance with the invention by the fact that the section forming the middle portion of the vehicle has a frame the ends of which are bent upwardly, whereby the bent ends of the frame substantially extend in the plane of division representing the connection of the adjacent sections.

If the vehicle is made in accordance with the invention, normal roof constructions may be maintained, the centre of gravity of the vehicle may be laid deeply and an advantageous connection between the individual sections, ensuring the required rigidity of the vehicle, also is rendered possible by the fact that the upwardly bent ends of the frame simultaneously serve for fixing the adjacent parts of the vehicle.

Preferably the upwardly bent ends of the frame extend into the range of the upper frame covering, whereby a particularly high rigidity is obtained. For constructional reasons as well as for an advantageous absorption of the forces, due to the weight of the vehicle and the shocks occurring on the road, the planes of division or at least one of them preferably are arranged obliquely to the vertical, particularly in such a manner that a front plane of division extending for instance at the dash board obliquely rises towards the front, and a rear plane of division extending for instance behind the rear seats obliquely rises towards the rear.

Furthermore, for an easier and more rigid connection of the individual sections to each other the bent ends of an eventually provided middle support of the frame of the middle section of the vehicle may be formed fork-like, or plate-like or in a similar manner, i. e. they are broadened at least over a part of the width of the vehicle. In connection with frames having lateral longitudinal carriers the bent ends of the longitudinal carriers may be stiffened against each other for instance above and below the dash board.

The frame, moreover, may form a rigid unit with the carriage body. Furthermore, the end sections provided with or without a special frame may, for instance, be self-supporting. Moreover, one of the end sections may carry the driving aggregate of the vehicle, whereby this aggregate directly may be flanged to the upwardly bent ends of the frame for the middle section, whereas the wall portion enclosing the driving aggregate substantially is carried by the latter.

The sections, furthermore, may fixedly or loosely be connected to each other, whereby elastic means, for instance rubber strips or springs or the like, may be interposed between the sections. In the case the sections are loosely connected to each other besides the advantage that equal individual sections may be used for the manufacture of vehicles of different types, the further advantage results that for an easier overhauling later on the vehicle may readily be taken to pieces or split up again into its individual sections.

In the accompanying drawing one construction of the invention is diagrammatically shown by way of example.

The vehicle for instance consists of the three sections A, B and C. The end sections A and C simultaneously carry the aggregates of the axes of the front and rear wheels respectively as well as eventually the driving aggregate of the vehicle, particularly in such a manner that

the end section, carrying the driven wheels, simultaneously also carries all the other driving members. The vehicle in this case may be constructed as vehicle with front drive or as vehicle with the rear motor drive. By exchanging the end sections, however, the one or the other drive selectively may be chosen.

The subdivision of the sections A, B and C is effected in the two planes $x—x$ and $y—y$, whereby the front plane obliquely rises towards the front, whereas the rear plane $y—y$ obliquely rises towards the rear. The middle section B has a frame *b* which, for instance, consists of a longitudinal middle carrier, or of lateral longitudinal carriers reinforced with regard to each other by cross carriers, or other cross reinforcements, or consists, for instance, of a double walled base plate. Both ends of the frame are bent upwardly and its front end b^1 extends about in the plane $x—x$, whereas its rear upwardly bent end b^2 substantially extends in the plane $y—y$.

The end sections A and C may be flanged to the upwardly bent ends b^1 and b^2 respectively by rivets, screws or in any other manner, eventually also rubber may be interposed between the sections.

By constructing the frame *b* with upwardly bent ends b^1 and b^2 an extreme rigidity of the middle section B on the one hand and a connection between the individual sections A, B and C on the other hand is obtained which is twist- and bending-stiff, because the connection of the end sections to the frame *b*, rigid per se, is effected on a broad surface.

By obliquely arranging the planes of division $x—x$ and $y—y$ the middle section B due to its weight is guided between the end sections A and C in the manner of a wedge.

BÉLA BARÉNYI.
KARL WILFERT.

PUBLISHED

MAY 25, 1943.

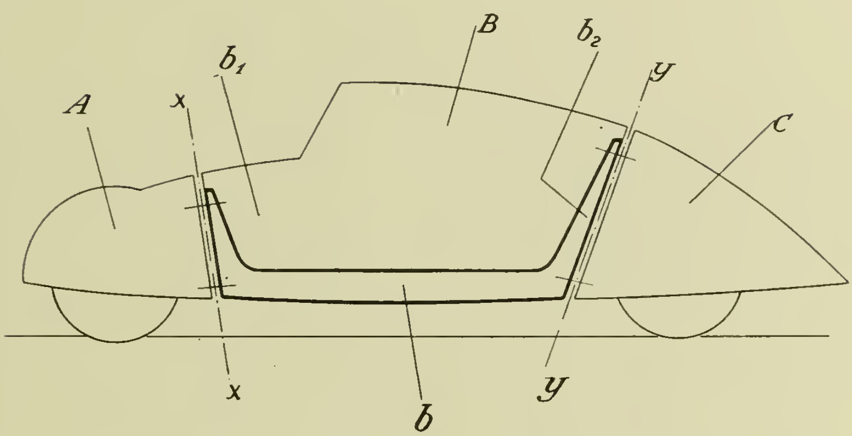
BY A. P. C.

B. BARÉNYI ET AL

CHASSIS FOR MOTOR VEHICLES SUBDIVIDED INTO
A PLURALITY OF LONGITUDINAL SECTIONS

Filed Dec. 5, 1940

Serial No.
368,684



BÉLÁ BARÉNYI
CARL WILFERT
INVENTORS

BY Haseltine, Lake & Co.
ATTORNEYS

Published May 25, 1943

Serial No. 368,728

ALIEN PROPERTY CUSTODIAN

HOLLOW GLASS HANDLE FOR DOORS AND WINDOW LOCKS

Mario Jacuelli, Naples, Italy; vested in the Alien Property Custodian

Application filed December 5, 1940

The object of the present invention is a hollow glass handle adapted for locking doors and windows, and the process for its manufacture. The glass handles now being used, are generally made with solid glass, either pressed or worked by hand or by machine, which cause such handles to be excessively heavy and of scarce esthetic value, and to require costly and heavy metallic supports.

The handle forming the object of the present invention, is made with hollow glass, and is obtained by blowing with the mouth or with a blowing machine, and is provided with a hollow connecting portion for attachment to the lock lever having a square section, both inside and outside of the door or window, either screw threaded or circular, according to requirements. The handle may be smooth, grinded or suitably decorated inside or outside. The handle so manufactured proves to be, together with its support, more artistic, lighter and cheaper than the handles produced up to the present.

The accompanying drawing shows schematically and by way of example the object of the invention.

In the drawing:

Fig. 1 shows a side view of the handle,

Fig. 2 shows a longitudinal section through the axial plane thereof, and

Fig. 3 shows the handle in plan seen from below.

Referring to the drawing, 1 indicates the glass handle shaped as an elongated apple, hollowed out in the inside as shown in 2. The handle is thinned out and bent in 3, leading up to connecting portion 5, provided inside with a short square hole 4. Said connecting portion 5 may be circular outside or may be also square in correspondence with its inner square hole as shown in Fig. 3. The handle may be provided on its outer surface with ornamental folds or ripples as indicated in 6.

The process of manufacture of the glass handle above described, consists in blowing a mass of glass in a suitably shaped mould, with square shaped blow pipe in correspondence with the connecting portion. When the elongated apple shape has been obtained, and before the glass has cooled completely, the whole is bent according to the required shape and is then definitely cooled.

It is evident that the handle may be made of different shapes and sizes in accordance with the shape and size of the mould employed.

MARIO JACUELLI

PUBLISHED	M. JACUELLI	Serial No.
MAY 25, 1943.	HOLLOW GLASS HANDLE FOR DOORS AND WINDOW LOCKS	368,728
BY A. P. C.	Filed Dec. 5, 1940	

Fig. 1.

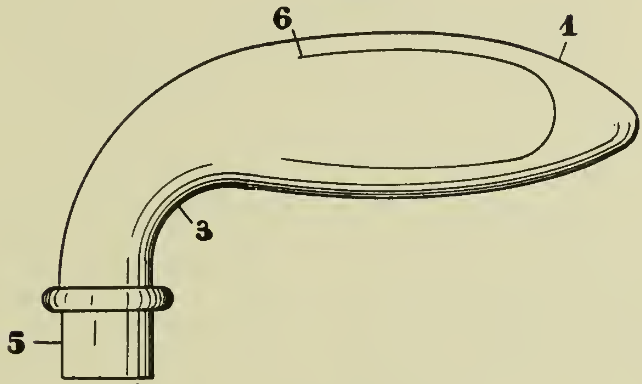


Fig. 2.

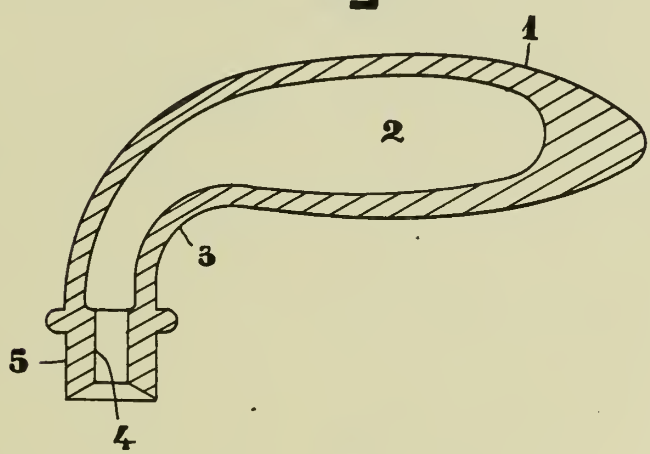
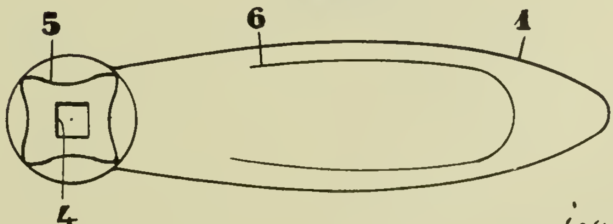


Fig. 3.



INVENTOR
MARIO JACUELLI
By Wachaufter Groff
Attys

Published May 25, 1943

Serial No. 368,848

ALIEN PROPERTY CUSTODIAN

SPRINGING, SPECIALLY OF MOTOR CARS

Karl Wilfert, Sindelfingen, and Béla Barényi, Boblingen, Germany; vested in the Alien Property Custodian

Application filed December 6, 1940

The invention relates to an improvement of the springing, specially of motor cars, of the kind with which the wheels are guided by means of track-altering springing half axles, specially the so called pendulum half axles, with respect to the frame. (With "frame" or "vehicle framework" herewith besides the vehicle frame proper also every other construction aggregate may be meant, which fills the duties of the frame, i. e. for instance also a self-contained car body or the like).

With such swinging half axles, specially pendulum half axles, with the springing of the wheels transverse forces arise at the contact point of the wheels with the road, which are transmitted by the joints by which the swinging half axles are connected with the frame onto the latter. If one of the wheels is sprung, the forces arising herewith are attempting to impart to the frame besides an upward motion also a motion transverse to the riding direction, in direction to the opposite wheel, the swinging half axle of the opposite wheel trying to tilt together with same over the contact point of the wheel with the road. By the transverse shocks caused by these transverse motions additional stresses on the frame and swinging phenomena may occur, which may under circumstances cause very disturbing effects.

By the invention these drawbacks are removed or at least lessened, the axle aggregate comprising the swinging half axles of the two wheels of the pair of wheels being able to yield with respect to the frame, transverse to the riding direction by an amount, corresponding to the track alteration of the wheels at the springing, wholly or at least partially. By these means it is possible that with the transverse shocks only a transverse motion of the axle aggregate occurs, while the frame or the vehicle framework may remain in its central position or will be influenced only slightly by the shocks.

Preferably the supporting piece, for instance a differential gear carrying the swinging half axles is yieldingly so connected with the frame, that when yielding with respect to the frame, it executes or is able to execute substantially only a transverse displacement without a rotating motion around a longitudinal axis. Additional rotating accelerations of the supporting piece are avoided herewith.

In realisation of the idea of the invention the supporting piece may be journaled on guides transverse to the riding direction or the supporting piece may be guided by means of a bow-guidance, for instance by means of a joint-square, displaceably at the frame.

If the supporting piece carrying the swinging half axles is connected swingingly with the frame, the jointing of the supporting piece onto the frame ensues preferably by means of a turning joint, arranged below the swinging half axle joints around which turning joint the supporting piece, i. e. for instance the differential gear case may swing for a lateral yielding of the axle aggregate.

The jointing to a turning joint arranged below the swinging axle joint, has the advantage that the axle aggregate takes a stabile position with respect to the frame, as the weight of the car body tries to bring the turning joint always back to its lower central position, so that the springs serving for taking back the supporting piece between it and the frame may be dimensioned comparatively weakly, or under circumstances may be entirely omitted. Furthermore by arranging a lower joint the track alteration of the wheels with respect to the frame is practically diminished.

The springing taking up the transverse motions of the axle aggregate with respect to the frame is preferably so formed that it has an increasing springing hardness at the yielding, transverse to the riding direction. The swinging half axles may be sprung either against the frame or preferably against the supporting piece. In the previous case it is necessary that with the arrangement of the springs the transverse variability between the swinging half axles and the frame is taken into consideration. Unguided spiral springs may under circumstances allow such a transverse variability without taking special additional measures.

In the drawing three types of the invention given by way of example are shown.

In Fig. 1 the swinging half axles *b* carrying the wheels *a* are jointed to a supporting piece *d*, for instance to the differential gear casing, by means of lateral joints *c*. This supporting piece *d* provided with transverse pins *e* serving as guides or with similarly acting sliding projections, by means of which the supporting piece is journaled transversely slidable in corresponding guidances *f* of the frame *g*. By means of springs *h* the supporting piece *e* is held in its central position with respect to the frame. At the occurring of transverse forces the supporting piece *d* may yield to the one or other side, opposite to effect of the springs *h*.

The swinging half axles *b* may be sprung

against the frame g or against the supporting piece d, which is preferable with respect to the transverse variability of the axle aggregate. The springing may ensue by means of unguided spiral springs or for instance by metal or rubber springs in the joints c stressed by torsion. With the type according to Fig. 1 for instance tension springs u are shown which may be connected at the one side the half axles b and at the other side either at v to the supporting piece d (left hand side of Fig. 1) or at v' to the frame, as shown at u' at the right hand side of Fig. 1.

In the example according to Fig. 2 the supporting piece d is guided at the frame g by the two guiding pieces or links i in the way of a joint-square in such a manner that the supporting piece is displaced in a bow around the lower joints of the guiding pieces or links i, but in parallel to itself. For replacing the supporting piece into its central position serves a rubber block k, which preferably is adhesively connected as well to the frame as to the supporting piece d and is stressed at the transverse displacement of the supporting piece d substantially for shearing. At the same time the rubber block is stressed also for pressure in such a manner that with increasing lateral displacement of the supporting piece d a constant increasing of pressure occurs. The rubber bumper k acts in this way as progressive swinging, so that with strong transverse shocks a comparatively strong replacing power is produced. Simultaneously the rubber bumper acts dampingly on the transverse motions. For springing the swinging half axles in vertical direction, serve the unguided spiral springs l which are supported against the projections m of the supporting piece d.

With the type given by way of example in Fig. 3 the supporting piece d formed as differential gear is journaled swingingly around a joint n which is placed below the joint c of the swinging half axles, arranged for instance in the central longitudinal plane. In this case the joint n connects the supporting piece d with the bow-shaped guiding link member o which is connected swingingly to the frame or to the vehicle framework by means of an elevated joint p. The supporting piece d is held in its central position by the springs q leaning at the one side against a projection r of the supporting piece d and at the other side the bow-shaped guiding member o. For the supporting of the latter against the frame furthermore serve the springs s which are preferably made hard in order to prevent an exceeding oscillation of the guiding member o. In vertical direction the swinging half axles are furthermore sprung by means of a transverse laminated spring t, secured in the supporting piece d.

With transverse shocks occurring at the wheel, the axle aggregate may yield with respect to the frame in transverse direction by the fact that on the one side the guiding link member o swings around the upper joint p and on the other side the supporting piece d swings around the lower joint n. The motion of the supporting piece d may be herewith a purely transverse displacement.

Under circumstances the guiding link member o may also be omitted which would correspond to a rigid fastening of it to the frame. Eventually the interposition of rubber bumpers between the guiding member o and the frame h would suffice. The yielding in transverse direction however would be as a rule comparatively small in this case.

Generally it is not necessary that the yielding in transverse direction between the axle aggregate and the frame corresponds to the maximal track alteration. In most cases it will be sufficient if a fractional part of the track alteration will be compensated by lateral yielding. If for instance the maximal track alteration for either swinging half axle amounts to 10 cm altogether, from the lowest to the highest springing of the wheel, in general a yielding of 2 to 3 cm between axle aggregate and frame transverse to the riding direction will be sufficient, as normally for the unevenness of the ground only a corresponding fractional part of the spring lift will be claimed.

KARL WILFERT.
BÉLA BARÉNYI.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

K. WILFERT ET AL
SPRINGING, SPECIALLY OF MOTOR CARS
Filed Dec. 6, 1940

Serial No.
368,848

Fig. 1.

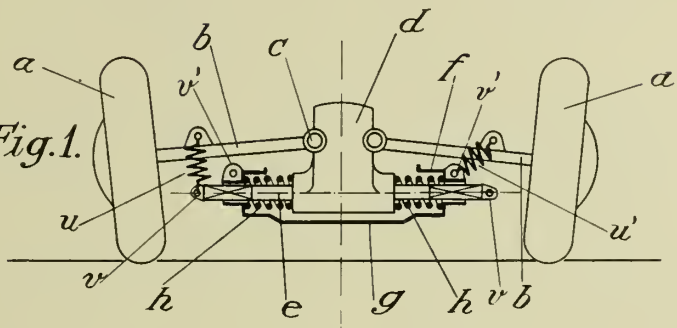


Fig. 2.

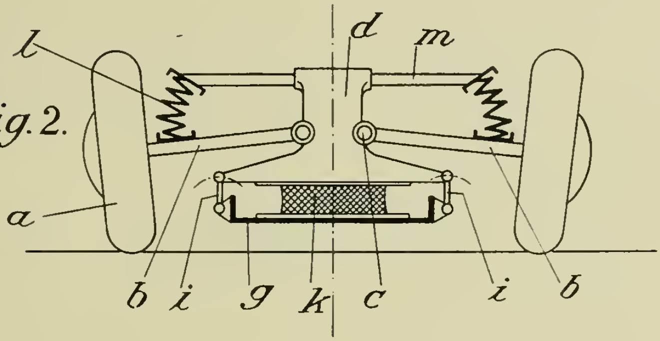
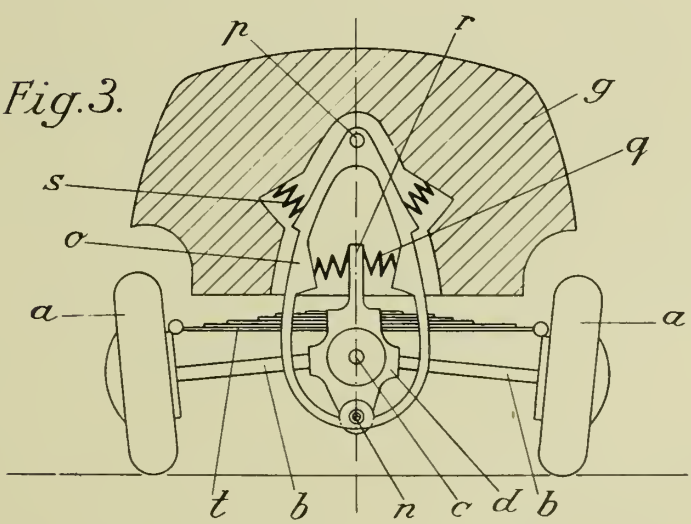


Fig. 3.



Karl Wilfert
Béla Barenyi
Inventors
By A. A. [illegible]
[illegible]
Attorneys

Published May 25, 1943

Serial No. 368,849

ALIEN PROPERTY CUSTODIAN

SPRINGING OF MOTOR CARS WITH SWINGING HALF AXLES

Karl Wilfert, Sindelfingen, and Béla Barényi, Boblingen, Germany; vested in the Alien Property Custodian

Application filed December 6, 1940

The invention relates to a springing of motor cars with swinging half axles, specially so called pendulum half axles, swinging together with the wheels as one unit around an interior framesided joint. (The expression "frame" is here to be understood in the most comprehensive sense and comprises all construction aggregates which may fulfill the duty of the frame, i. e. also for instance self contained car bodies.)

With the springing of such swinging half axles which are connected to the frame immediately by means of a joint, at the contact places of the wheels with the road, transverse forces arise working in corresponding manner between the swinging half axles and the frame. The shocks occurring herewith may produce under circumstances high stresses onto the frame and swinging phenomena.

Accordingly it is a feature of the invention that the swinging half axles are arranged yieldingly with respect to the frame and to each other in transverse direction to the vehicle, and that especially in such a way that they may yield in transverse direction corresponding to the forces tending to an alteration of the track. Preferably the yieldingness herewith is chosen so great that the entire track alteration which would occur at the swinging half axles would not be yieldingly journaled, may be fully compensated. This track alteration may amount to about 5 to 10 cm altogether with vehicles with pendulum half axles. In many cases however it is sufficient if a partial compensation of the track alteration is made possible, if only the transverse shocks are yieldingly taken up in a satisfactory way.

According to a further feature of the invention the direction of the yieldingness is not exactly transverse to the riding direction, but is inclined to it under an angle, and specially under an angle which is determined by the connecting line between the contact point of the wheel with the road, and the inner, i. e. framesided joint of the pertaining half axle.

A specially practical type of the invention is the one in which the swinging half axles are journaled at their end on lever arms which may swing around pivots that are placed above or preferably below the joints for the swinging half axles. The swinging half axles may in this case be sprung against the lever arms or against the frame, the lever arms may be sprung against the frame or the swinging half axles. Also a springing of the swinging half axles against each other or of the lever arms against each other may be provided. In the drawing in Figs. 1 and 2 two springing possibilities of pendulum half axles are shown diagrammatically, while Fig. 3 shows a more structural type.

In Fig. 1 the pendulum half axles *b* carrying the wheels *a* in joints *c* are jointed at lever arms *d* being themselves jointed at *e* to the frame *f* or to a corresponding part of the vehicle. The lever arms *d* are herewith so arranged that the straight connecting line between the contact joint *g* of the wheel with the road and the joint *c* includes an angle $\alpha=90°$ with the straight connecting line between the joints *c* and *e*. The joint *c* may herewith swing around the joint *e* under the effect of the force A arising in the contact joint *g* and being directed towards the joint *e*, in the direction of this force, whereby the track alteration otherwise arising in the contact point *g* is compensated. As shown in Fig. 1 the pendulum half axle *b* is sprung by means of a spring *h* against the lever arm *d* and the lever arm *d* by means of a spring *i* against the frame.

The type according to Fig. 2 is distinguished from the type Fig. 1 substantially by the fact that the joint *e* around which the lever arms *d* may swing is not arranged immediately at the frame *f* but at a compensating lever *k* which may swing around a central pin *l* at the frame *f* against the action of the two springs *m*, and carries the joint *e* for the two wheel suspensions. The springs *i* in this case being interposed between the lever *d* and the compensating lever *k*.

With the type according to Fig. 3 the swinging half axles or pendulum half axles *b* are sprung by the medium of guiding pieces *n* against the frame by the medium of a transverse laminated spring *p* fastened to the frame or to a part *o* connected to the frame. The lever arm *d* carrying the inner joints *c* of the swinging half axles is swingingly arranged also in this case around a lower joint *e* and supported against the frame, or against the other lever arm *d* by means of the spring *i*. The angle *g*—*c*—*e* preferably amounts again to 90°, whereby the joint *c* may yield as well to the vertical as to the horizontal forces arising in it.

The arrangement may however be so made that the motion of the inner joint *c* ensues exclusively in a direction transverse to the riding direction, the yieldingness being so dimensioned in its size that it corresponds to the track alteration which would arise at the contact point of the wheel with the road, if the journalling of the swinging half axles would not be yielding.

Instead of the journalling of the swinging half axles of the lever arms, another yieldingness transverse to the riding direction may be provided, for instance in such a manner that an intermediate piece carrying the joint *c* of each swinging half axle is journalled displaceably transverse to the riding direction at the frame.

KARL WILFERT.
BÉLA BARÉNYI.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

K. WILFERT ET AL

SPRINGING OF MOTOR CARS WITH SWINGING HALF AXLES

Filed Dec. 6, 1940

Serial No.

368,849

Fig. 1.

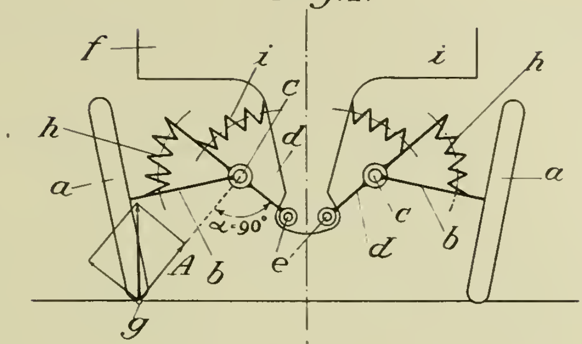


Fig. 2

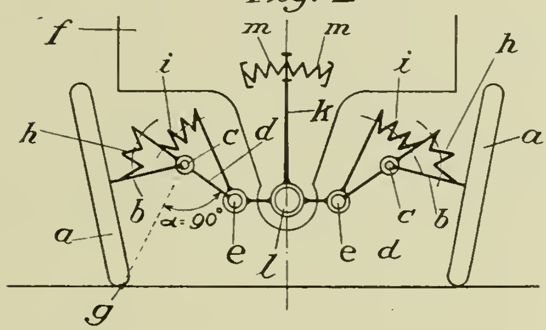
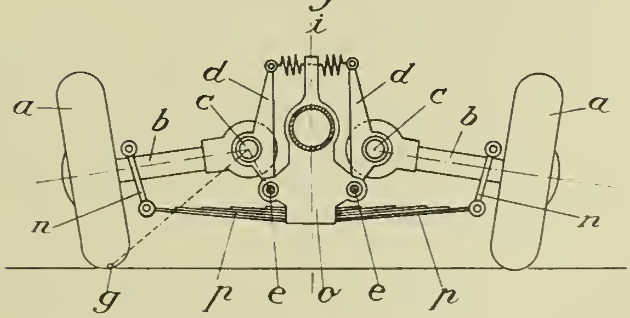


Fig. 3.



Karl Wilfert
Béla Barenyi
Inventors
By A. A. [illegible]
[illegible]
Attorneys

Published May 25, 1943

Serial No. 368,866

ALIEN PROPERTY CUSTODIAN

TRACK CHAIN VEHICLES

Wilhelm Jirsak and Otto Falk, Breslau, Germany; vested in the Alien Property Custodian

Application filed December 6, 1940

This invention relates to track chain vehicles and refers more particularly to a mounting for the runners of such vehicles.

Vehicles which are movable along track chains are provided with runners carried by supporting springs. Track chains upon which the vehicles are moved are provided with guide-rollers. Since the plates which compose the track chains adapt themselves to the unevenness of the ground, these guide rollers are subjected to strong transverse forces and turning forces.

These forces and the turning moments created thereby may be absorbed by a yieldable intermediate member situated between the roller support and the spring support of the vehicles, or they are received by the springs themselves. The result is that the springs and their attachment suffer considerable strain and may be easily broken.

Attempts to eliminate this danger and to prevent damage to runners or rollers resulting from the uneven arrangement of the plates of a track chain have not been successful so far. Furthermore, when constructing a runner suspension for the vehicles it should be taken into consideration that masses which are not supported by springs should be as small as possible in order to provide an easy and economic track movement. Therefore, the springs must be located as closely as possible to the axes of the runners. But, when such a construction is used, the turning movements resulting from the unevenness of the track chain will affect the springs and will subject them to a severe strain.

An object of the present invention is to eliminate these drawbacks and to provide an effectively operating and sturdy runner suspension for track chain vehicles.

Other objects of the present invention will become apparent in the course of the following detailed specification.

In accomplishing the objects of the present invention, it was found advisable to secure the supporting springs of the runners against the detrimental effect of transverse and turning forces by providing a guide for the runner support, said guide being rigidly connected with the vehicle. In accordance with the present invention, the supporting springs are situated between two runners discs which are mounted upon the same axle and which constitute a single runner.

This axle of the runner is mounted in a supporting casing which is movably guided in relation to an axle support which is attached to the vehicle. The supporting springs have the form of half leaf springs and are rigidly connected with the frame of the vehicle in such manner that a line extending between the place of attachment of each individual runner support to the vehicle and the axle of the runner extends obliquely. The runners are so closely arranged that the spring support of each runner which consists of a plurality of half leaf springs, projects into the space between two discs of an adjacent runner, the swinging of one runner being limited by a stop carried by a spring support of an adjacent runner.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawing showing, by way of example, a preferred embodiment of the inventive idea.

In the drawing:

Figure 1 is partly a side elevation of and partly a section through a runner suspension which is constructed in accordance with the principles of the present invention; and

Figure 2 is a top view, looking in the direction of the arrow x shown in Figure 1.

The runner suspension which is shown in the drawing comprises a runner consisting of two runner discs 1 and 2 which are mounted upon the ends of a common axle 3. The axle 3 is mounted in an axle casing 4 and includes the bolts or pivot 5 and 6. Resilient supports 7 and 8 consist of a plurality of half leaf springs the adjacent ends of which engage the bolts or pivot 5 and 6. The spring supports 7 and 8 are firmly connected with a carrier or support 9 which is rigidly connected to the frame 10 of the vehicle.

An axle support 11 is also rigidly connected with the support 9. The support 11 includes two guides 12 and 13 which are in engagement with projecting portions 14 and 15 of the casing 4.

The casing 4 has another projection 16 which cooperates with a projection 17 attached to the spring support of an adjacent runner. The projection 16 and 17 limit the extent of upward movement of one runner in relation to another one.

This arrangement has the advantage that the guides 13 and 14 receive all the transverse forces and turning forces which are transmitted by the runners, so that these forces are prevented from reaching the springs. The spring supports 7 and 8 may be moved only in the direction of their plane of oscillation and thus any excessive forces upon the springs and upon the roller suspension are effectively avoided.

Due to the provision of two roller discs carried

upon a common axle and constituting a single runner, the plates of the track chain are subjected to pressure close to their opposed edges, so that the bending of the plates and the resulting strain upon the links joining the plates are avoided or diminished to the greatest possible extent. Due to the inclined arrangement of the spring supports, which engage the middle of the axle, the springs may be made longer and more supple, as compared to horizontal leaf springs and rollers situated at equal intervals which are known in prior art.

Another advantage of the described construction is that it is possible to place the runners very closely to each other by arranging the springs between the roller discs of each runner. The small distance between the rollers makes it possible to diminish the turning movements transmitted by the track chain plates and their links to the greatest possible extent.

It is apparent that the specific illustration shown above has been given by way of illustration and not by way of limitation, and that the structure above described is subject to wide variation and modification, without departing from the scope or intent of the invention. All of such variations and modifications to be included within the scope of the present invention.

WILHELM JIRSAK.
OTTO FALK.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

W. JIRSAK ET AL

TRACK CHAIN VEHICLES

Filed Dec. 6, 1940

Serial No.
368,866

Fig.1

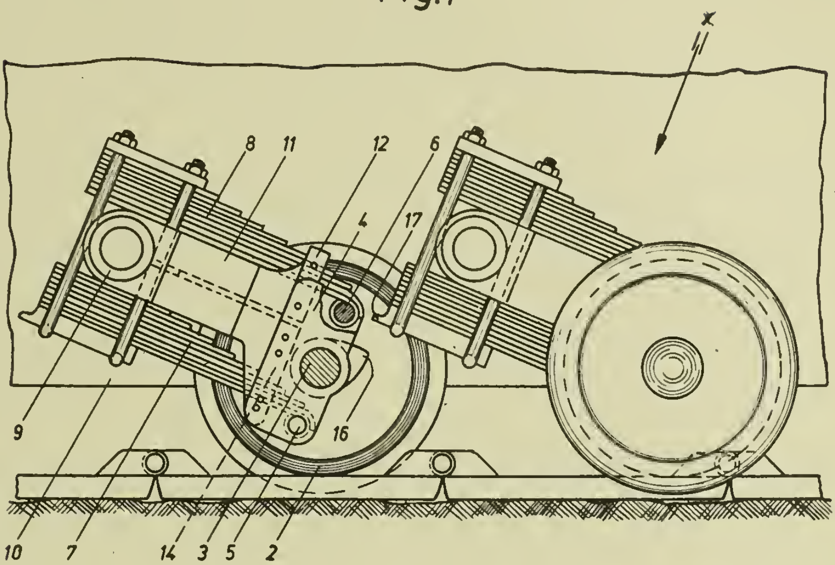
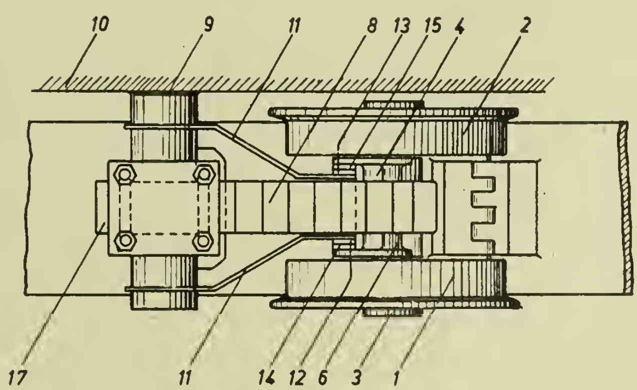


Fig.2



Inventors
Wilhelm Jirsak and Otto Falk

By

Richards & Geier

ATTORNEYS

Published May 25, 1943 Serial No. 369,376

ALIEN PROPERTY CUSTODIAN

PROCESS OF AND APPARATUS FOR MAKING BUTTER FROM CREAM

Willi Fritz, Weihenstephan, Germany; vested in the Alien Property Custodian

Application filed December 10, 1940

My invention relates to improvements in the process of and apparatus for making butter from cream, and the objects of the improvements are, first, to provide a process by means of which the butter is separated from the cream within an exceedingly short period of time, second, to provide a process which is effective in so far as a high proportion of the butter is separated from the cream, third, to provide a process which is economical, and fourth to provide a process, by means of which the butter may be continuously separated from a stream of cream. Further, an object of the improvements is to provide an apparatus which is simple in construction and effective in operation, and which may be set with its operative parts into different positions, whereby it is adapted to the character of the cream, the temperature and other atmospheric conditions. With these and other objects in view my invention consists in spreading the cream into a film, and agitating all the portions of the said film so as to transform the same first into a foam and then agglomerating the particles of butter. In the preferred process the said film is made to move from a supply thereof past the agitating device or devices and to a discharge. Any suitable method may be provided for thus shaping the cream into a film, but I prefer to make use of centrifugal action, the cream being made to flow into a cylindrical drum having agitating devices mounted therein close to the inner surface of the circumferential wall of the drum, the said drum and agitating devices being rapidly rotated relatively to each other for spreading the cream on the surface of the circumferential wall of the drum. Preferably the agitating devices are shaped so that by the said relative rotary movement they influence the flow of the film from the supply to the discharge resulting from the hydrostatic fall of the incoming liquid.

For the purpose of explaining the invention an example embodying the same has been shown in the accompanying drawing, in which the same reference characters have been used in all the views to indicate corresponding parts. In said drawing

Fig. 1 is a sectional elevation showing the apparatus,

Fig. 2 is a sectional elevation taken on the line 2—2 of Fig. 1, and

Fig. 3 is a detail plan view showing the agitating device of Fig. 1 with certain modifications.

Referring now to the figures, the apparatus comprises a cylindrical drum 1 fixed to a suitable upright 14 and having a jacket 11 connected with intake and delivery pipes 15 and 16 for circulating a heating or cooling medium therethrough. The said drum has a supply 9 for the cream and a discharge 10 in the form of a gutter. Preferably the said gutter 10 is suitably supported on the floor. Preferably the said gutter forms the bottom part of a jacket disposed around the delivery end of the drum and adapted to gather the matter delivered from the drum.

Coaxially of the drum 1 a shaft 2 is provided which is rotatably mounted in a suitable bearing 17 provided in the upright 14 and which is provided with suitable driving means such as a belt and pulley 13 for rapidly rotating the same say at a circumferential-velocity of from 15 to 20 meters per second. On the said shaft agitating members are mounted which consist of blades *3a*, *4a*, *5a*, *6a*, *7a* and *8a* mounted on radial members 3, 4, 5, 6, 7, and 8 secured to the shaft 2, the said blades being mounted on the said members so as to be in contact with or near the circumferential wall of the drum 1. The blades *3a* to *8a* may be made from wood or other suitable material. As shown, the said blades are mounted on the members 3 to 8 so as to be radially shiftable thereon, and as shown, they are guided in slots 18, cleats 19 being secured to the blades for holding the same in position within the said slots 18. Thus, blades are thrown by centrifugal action into contact with the circumferential wall of the drum 1. But I wish it to be understood that my invention is not limited to the manner of mounting the blades so that they are in sliding engagement with the drum 1. The blades *3a* to *8a* are disposed angularly of the longitudinal axis of the drum and so that they are adapted gradually to move the cream from the supply 9 to the gutter 10. The successive blades are displaced at right angles around the shaft 2, and preferably they are inclined in different senses as appears from a comparison of Fig. 1 and 3. The blades *3a*, *5a* and *7a* are mounted at comparatively large angles to the axis of the drum, and they are set to as to move the film of cream from the supply 9 to the discharge 10, and the blades *4a*, *6a* and *8a* are mounted in the opposite sense and so as to have the tendency to move the cream in the opposite direction. But the angle of inclination of the blades *4a*, *6a* and *8a* is smaller than that of the blades *3a*, *5a* and *7a*, so that the combined action of all the blades is a movement of the cream towards the discharge. By thus inclining the blades in different senses the particles of the cream are thrown by the successive blades against one another.

I wish it to be understood that I do not limit myself to the construction shown in the figures, in which the blades are inclined in different senses.

Preferably the members 3 to 8 are mounted so that the angularity of the blades may be varied, and as shown, means are provided for thus varying the angularity during the operation of the apparatus. As shown more particularly in Fig. 3, the members 3 to 8 are guided in diametrical bores 20, and they are held in position in the said bores by means of shoulders 21 and nuts 22. To the members 3 to 8 arms 24 are fixed, and the arms 24 of the members 3, 5 and 7 and of the members 4, 6 and 8 are connected respectively to rods 25 and 26 disposed longitudinally of the shaft 2. The said rods are guided in a collar 27 fixed to the shaft 2, and they bear with their inner ends on rings 28 and 29 embedded in circumferential grooves 30 and 31 made in the upright 14, springs 40 being provided for holding the rods 25 and 26 in contact with the rings 29 and 28. The said rings 28 and 29 are adapted to be pushed inwardly by means of rods 32 and 33. For shifting the rods 32 and 33 suitable means are provided. As shown the said rods are screw-threaded at their outer ends and they carry nuts 34 bearing on a disk 35 fixed to the upright by means of screws 36. I have found that the adjustment of the blades is valuable in such cases where the character of the cream to be treated in the apparatus varies. In such cases in which cream of uniform character is treated in the apparatus, the blades may be set in the proper position once for all, either by means of the mechanism described herein or by means which are more simple in construction.

The operation of the apparatus is as follows: The drum is either heated or cooled by means of a suitable heating or cooling medium supplied through the pipes 15 and 16, the shaft 2 is rapidly rotated, and cream is supplied through the intake 9. By the rapid rotation of the first blade *3a* the said cream is thrown against the circumferential wall of the drum 1 and spread thereon into a thin film. By the inclined position of the blade *3a* the said film is gradually moved to the left and towards the discharge 10. When the film gets into the space covered by the blade *4a* it is acted upon by the said blade in the opposite sense the said blade having the tendency to move the film from the left to the right. Thus the particles of the cream are thrown against each other. But by reason of the greater angularity of the blade *3a* the general direction of the movement is such, that the film gradually moves from the right to the left. During such movement all the particles of the film are successively agitated by the blades, and the cream is first transformed into a foam and thereafter the butter is formed, whereupon the mass is delivered through the gutter 10 with the globules of butter agglomerated therein.

I have found that by the high agitation of the cream by the blades, and by the action of the blades on the thin film all the particles of butter are energetically rubbed on one another and on the wall of the drum, and that thereby the butter is rapidly agglomerated.

The cream should be acted upon by the blades without interruption, and therefore the length of the blades is such that the cylindrical paths of the adjacent blades meet or overlap each other. Further, it is important that the blades move close to the circumferential wall of the drum, so that their action on the thin film is insured, though it is not always necessary that the blades are in sliding engagement with the said wall.

In the construction shown in the figures, in which the shaft 2 is rotatable, the blades *3a* to *8a* are thrown into sliding engagement with the wall of the drum by centrifugal action, the said blades being shiftable in the slots 18.

The matter delivered from the drum is still subject to centrifugal action and therefore I provide the hood 12 by means of which the matter is gathered.

It is important that the cream passing through the drum is continuously aerated for removing vapors developed during the operation and for forming the cream into foam, and for this purpose the drum is opened at least at its delivery end, so that air or other gaseous fluid which may be preferred has free access to the interior of the drum.

By the word "sense" as used herein, I mean angularity.

In the operation of the apparatus I have found that the butter is separated from the cream within 12 or 15 seconds.

WILLI FRITZ.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

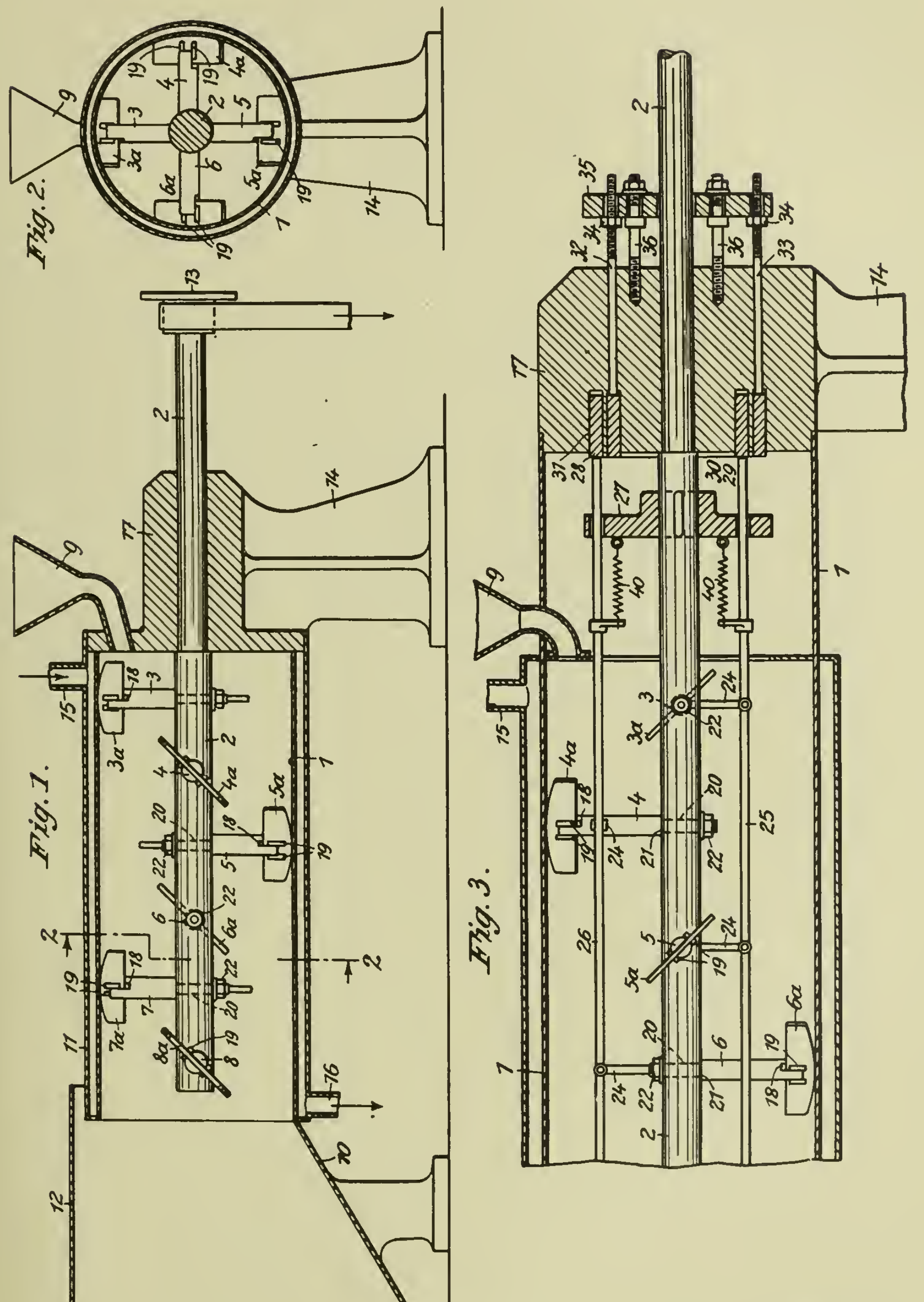
W. FRITZ

PROCESS OF AND APPARATUS FOR MAKING BUTTER FROM CREAM

Filed Dec. 10, 1940

Serial No.

369,376



Inventor
Willi Fritz
By
Blair, Curtis & Hayward
Attorneys

Published May 25, 1943 Serial No. 369,452

ALIEN PROPERTY CUSTODIAN

GRAB FOR HOISTING LOADS

Ewald Scharpenberg and Herbert Bönnhoff, Wetter/Ruhr, Germany; vested in the Alien Property Custodian

Application filed December 10, 1940

The invention relates to a grab for hoisting loads, said grab having crossed tong arms which close under the action of the load.

The known grabs of this type, in which the tong arms, actuated for instance by means of pull links, are connected by a hinge bolt arranged at the point of intersection of the arms or, when a bridge is provided, by two hinge bolts one at each side, possess the inconvenience, that the direction of pull of the tong arms extends obliquely to the surface or that an approximately perpendicular direction of pull is obtained only when the width for which the frab is opened corresponds to the distance between the hinge bolts. As, however, the closing force of the tong arms effected by the load depends on the direction of pull of these arms and is greatest in perpendicular direction to the surfaces at which the tong arms clamp the load, this closing force decreases the more the closer gets the link bolt or get the link bolts of the tong arms to the point of intersection of these arms. Whereas the closing force of grabs with tong arms connected at the point of intersection decreases with increasing width of opening of the tongs, this occurs, in grabs in which the oscillation points of the tong arms are displaced by a bridge in outward direction at both sides, only when the tongs spacing is greater or smaller than the distance between the hinge points. A grab of this last type possesses therefore a favorable efficiency only when the distance between the hinge points and the width of the opening of the tongs are approximately equal, that is only at a certain opening width of the tongs or at a certain breadth of the load.

According to the invention a closing force of the grab directed approximately perpendicularly to the load and therewith a favorable efficiency of the grab is attained at any opening width of the tongs, thereby that each tong arm is connected at the lower end with an auxiliary arm, the free end of said auxiliary arm being hingedly connected with the other tong arm, the hinge points of the auxiliary arms being situated at each side outside the crossing of the tong arms. The tong arms and auxiliary arms of the grab may consist of several superposed arms. For obtaining a uniform pressure surface of the tong arms upon the load, pressing pieces may be provided on the lower ends of the tong arms, said pressing pieces being oscillated relative to the tong arms in dependence on the movement of the auxiliary arms.

By the construction of the grabs according to the invention an increased closing force of the tong arms acting approximately perpendicularly to the direction of pull is obtained at all widths of the opening of the tongs, so that the grab can be used for lifting loads of different breadths and securely holds these loads with the clamping force which is required.

A grab constructed according to the invention is illustrated by way of example in the accompanying drawing, in which

Fig. 1 shows the grab in front view,

Fig. 2 shows it in side view, and

Fig. 3 shows separately the tong arms and the auxiliary arms of the grab.

The grab consists substantially of the crossing tong arms a, a^1 and of the auxiliary arms b, b^1 connected with the tong arms by means of bolts f, g. The auxiliary arm b is hingedly fixed on the tong arm a by the bolt g and is connected at its lower end by a bolt f^1 with the tong arm a^1. In similar manner the auxiliary arm b^1 is hingedly mounted on the tong arm a^1 by means of a bolt g^1 and hingedly connected at its lower end by the bolt f with the tong arm a. The hinge points g, g^1 can be arranged out of the middle, so that the tong arms a, a^1 as well as the auxiliary arms b, b^1 cross. U-shaped pressing pieces m are held on the lower ends of the tong arms a, a^1 by the bolts f, f^1 and form a closed pressing face and bear preferably with their bridge n against the auxiliary arms b, b^1. The grab may be fixed on the hoisting rope of the lifting device by pull links c which, by means of bolts i, are hingedly connected with the free ends of the tong arms a, a^1 and connected by a bolt h with a hoisting eye d. For holding the tong arms in the open position, a hook l is provided which is oscillatable about a bolt h and engages over a bolt k on one of the tong arms a, a^1 and is unhooked when the grab closes about the load.

As shown in Fig. 2, several tong arms a, a^1 and auxiliary arms b, b^1 may be arranged superposed the one on the other and may be connected the one with the other by means of the bolts f, g or f^1, g^1. In grabs for smaller loading, the free ends of the tong arms a, a^1 may be constructed as handles, so that the grab may be operated by hand.

The operation of the grab constructed according to the invention is as follows:

After the grab has been lowered onto the load the hook l is unhooked, whereby the tong arms a, a^1 automaticaly close under the action of the weight of the hook until the pressing pieces m press against the surface of the load. At the

hoisting of the grab, the load effects an additional closing pressure of the tong arms by the lever effect of the tong arms a, a^1 in conjunction with the auxiliary arms b, b^1 hingedly mounted on these tong arms at opposite points, so that the load is rigidly clamped between them. The opening of the grab or the detaching of the tong arms from the load is automatically effected when the load is put down or after the tong arms a, a^1 have come to rest on top of the load when the grab is further lowered until the locking hook l engages over the pin k. Instead of the locking hook l as shown, any other suitable means for holding the tong arms in the open position may be provided. The number of superposed tong arms a, a^1 and auxiliary arms b, b^1 can be adapted to the load actually to be hoisted or the grabs for heavier loads can be equipped with a corresponding number of superposed tong arms and auxiliary arms.

EWALD SCHARPENBERG.
HERBERT BÖNNHOFF.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

E. SCHARPENBERG ET AL

GRAB FOR HOISTING LOADS

Filed Dec. 10, 1940

Serial No.

369,452

Fig.1

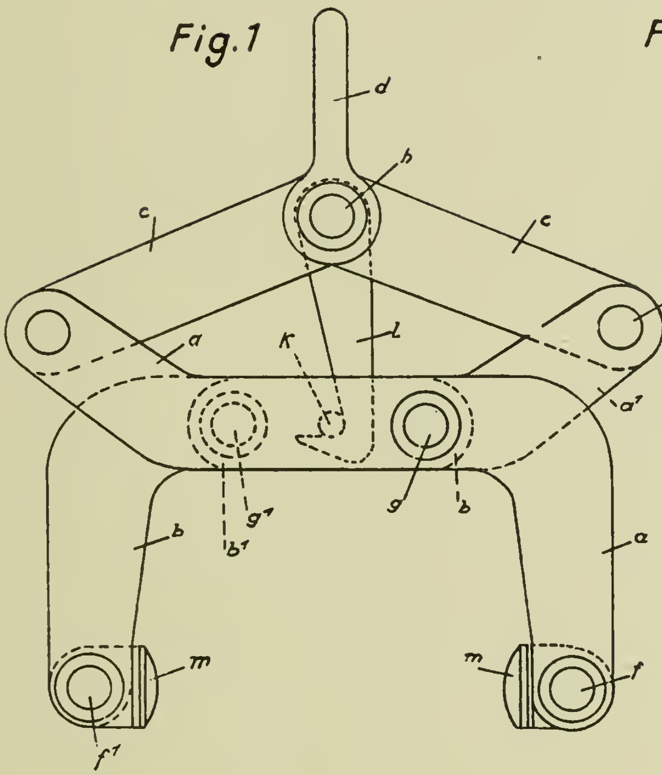


Fig.2

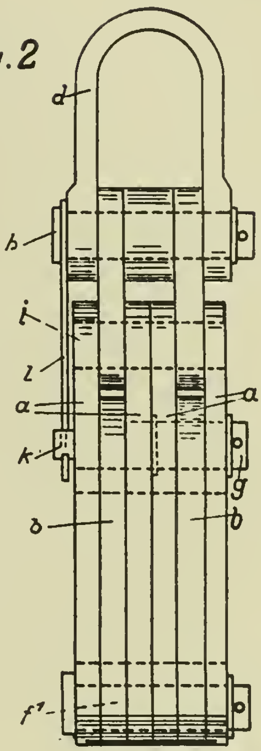
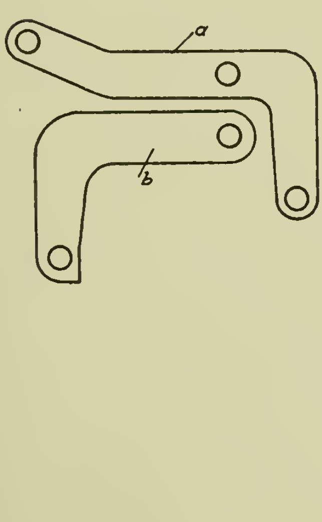
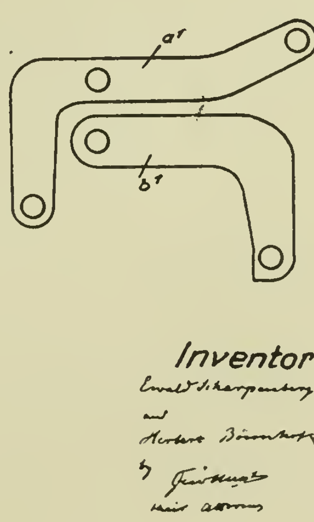
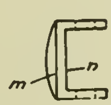


Fig.3







Inventors

Ewald Scharpenberg

and

Herbert Bornhoft

by

their attorneys

Published May 25, 1943

Serial No. 369,478

ALIEN PROPERTY CUSTODIAN

SIEVE-BOTTOMS FOR DISTILLING, RECTIFYING AND WASHING COLUMNS

Helmut Stock, Berlin-Wannsee, Germany; vested in the Alien Property Custodian

Application filed December 10, 1940

It is well known to use bottoms for fractional columns and the like which constitute a plain sieve or screen. Such bottoms have a good efficiency, but they have the disadvantage that the fluid is only retained on the bottom at a certain minimum load, and there is a tendency for uneven functioning of the holes at low load or inclined position of the bottom. The same disadvantage, particularly at low load, is also found in bell- or tunnel-bottoms.

This invention, in eliminating the disadvantages of the known arrangement, gives a sieve-bottom especially suitable for a wide working range. For this purpose the invention consists in its general form in that, the sieve-bottom is formed undulatory. Through this formation of the bottom it is avoided, that by inclination of same vertical to the direction of flow a section of the sieve-bottom becomes inoperative. In this way a good contact between the fluid and the vapours is assured at all points of the bottom.

The effective section of the bottom according to invention is preferably formed rectangular, in order that the free segments remaining on either side of this surface can be utilized for the gas-inlet. According to invention the sieve-bottom itself is fitted in a collecting box which serves to receive the return- or washing-fluid respectively, and into which the gasses or vapours enter laterally in order that they first of all reach the underside of the sieve-bottom. Hereby is attained, that the laterally entering gases or vapours sink the existing fluid level in the collecting box below the sieve-bottom, so far that, conforming with the existing load a corresponding sieve-bottom surface becomes free. At smallest loads only the crest holes of the undulation are freed. By increased load the gases or vapours displace the fluid in the collecting box beneath the sieve-bottom which rises through the tubes provided in the sieve-bottom.

Thus a mutual reaction exists between the quantity of gas or vapour respectively, and the lower fluid level. Under constant load the level remains constant. Herewith the disadvantage could arise that by duration the fluid in the collecting box be affected by the temperature prevailing within this box, it thereby sustaining chemical changes. But in order to avoid this, and in accordance with a further characteristic of the invention, orifices are provided below the sieve-bottom in the box which receives the return- or washing-fluid respectively, and through which a part of the fluid flows ensuring a constant renewal. Instead of these orifices a connecting pipe with cock can be provided between fluid inlet and the underside of the sieve.

The bottom according to invention offers another advantage over bell-bottoms, in that the areas required for the gas-inlet, and for the fluid in- or outlet respectively, are so arranged that a maximum effective exchange-area remains free. To this comes that the exchange-area has a rectangular form thereby constituting ideal flow conditions.

A further advantage over bell- or tunnel-bottoms is to be seen in that with a low or medium load the fluid in the collecting box is mixed with gas bubbles form its very base, thus the fluid in the collecting box participates over its whole depth in the exchange with vapours.

For some fractional processes it is desirable to keep the loss of pressure of the bottom as small as possible. In this case, when the load is so great, that the whole sieve-bottom area is free it is possible to drain the fluid in the collecting-box into the bottom below by a drain-cock operated externally, thus normal operating conditions as with a plane sieve-bottom are attained.

This invention offers a further possibility; in that baffles or contacting means, such as a packing material, can be fitted in the gas-inlet cross-sections. Herewith a considerably increased free-space velocity and therewith a decreased column cross-section or a smaller distance between the several bottoms is attained. Packing or contacting materials which extensively avoid the detrimental carrying away of fluid drops by the gases can be utilized most effectively.

In the accompanying drawings several constructional examples of sieve-bottoms as per the invention are shown.

Fig. 1 shows a plan view, whilst Fig. 2 shows a section A—B of Fig. 1, and Fig. 3 a section C—D of Fig. 2.

Figs. 4 and 5 show further constructional forms of the bottom as per invention, whereas Fig. 6 shows a sectional view of a distillation column into which the sieve-bottoms as per invention are fitted.

The undulatory formation of the sieve-bottom 1 is best seen in Fig. 3. The bottom is arranged in the collecting box 2, in which as may also be seen from the drawing, the fluid flows in over the edge of this box through socket 3. The fluid leaving the box on the opposite side, flows through socket 4. Rising-pipes 5 are arranged in the sieve-bottom in order that with heavy loading the fluid may pass through the bottom onto the upper-side of same. In the side-walls

of box 2, orifices 6 are formed through which a part of the fluid may enter the collecting box below the sieve-bottom, ensuring a continuous renewal of the fluid here also.

In the constructional form shown in Fig. 4 contacting materials 7 are arranged in the gas-inlet cross-sections. These which may for example consist of Raschig-rings whose diameter is equal to the height, are held in position by sieves 8.

In the constructional example shown in Fig. 5 a connecting pipe 9 is arranged between the inflowing section of collecting box 2 and the underside of sieve 1, and fitted with a valve 11 instead of the orifices 6 shown in Fig. 3. Furthermore this diagram shows a pipe-line 10 with stop-cock 12 which by a correspondingly heavy load permits the fluid under the undulatory bottom 1 to be let into draining-socket 4.

In order to show the arrangement of the sieve-bottoms as per invention in a column, a whole distillation column is shown in Fig. 6. This column which is constructed in the usual form consists of a shell 13 with openings 14 and 15 for charging the liquid to be distilled and leading off the vapours being fractionated. Within the column eight sieve-bottoms are provided, which are given the reference 1 in accordance with Figs. 1–5. In the lower part of the column a heating coil 16 is provided in the usual manner in order to vaporize a part of the liquid. The vapours thus produced pass through the several bottoms, and after being fractionated leave the column by the opening 15. The sieve-bottoms are filled with reflux which is introduced into the column by the pipe 17 and descends from one bottom to the next below by the overflow-pipes 3 or 4 respectively. Fig. 6 does not show how the gases can reach the underside of the sieve-bottoms, but this can be seen from Figs. 2 and 4.

HELLMUT STOCK.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

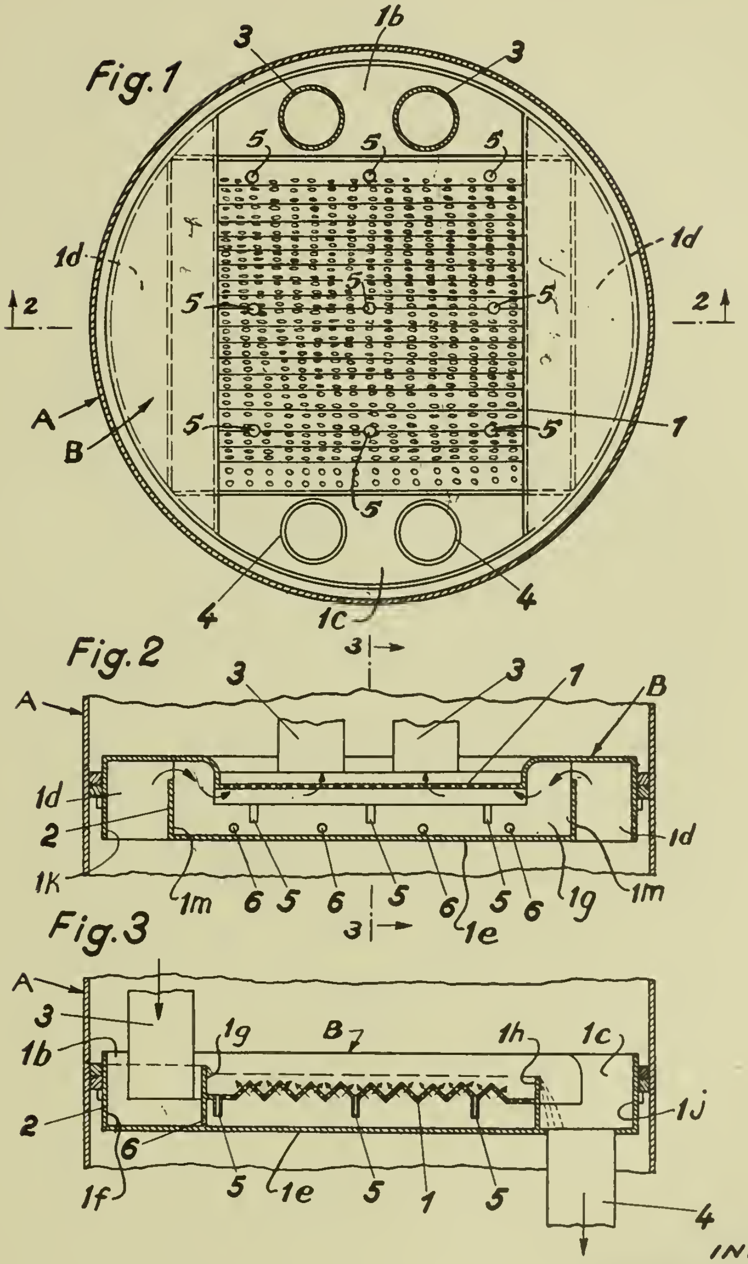
H. STOCK

SIEVE-BOTTOMS FOR DISTILLING, RECTIFYING AND WASHING COLUMNS

Filed Dec. 10, 1940

Serial No. 369,478

3 Sheets-Sheet 1



INVENTOR
HELLMUT STOCK,

BY Bailey & Larson

ATTORNEYS

PUBLISHED

MAY 25, 1943.

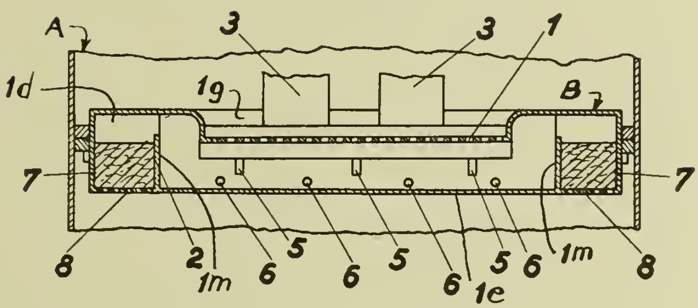
BY A. P. C.

H. STOCK
SIEVE-BOTTOMS FOR DISTILLING,
RECTIFYING AND WASHING COLUMNS
Filed Dec. 10, 1940

Serial No.
369,478

3 Sheets-Sheet 2

Fig. 4



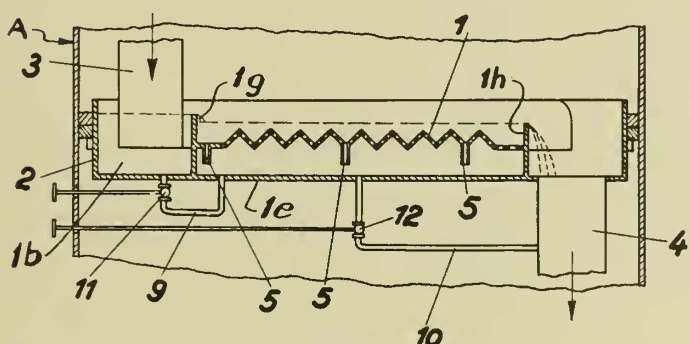


Fig. 5

INVENTOR
HELLMUT STOCK,

BY Bailey & Larson
ATTORNEYS

PUBLISHED

MAY 25, 1943.

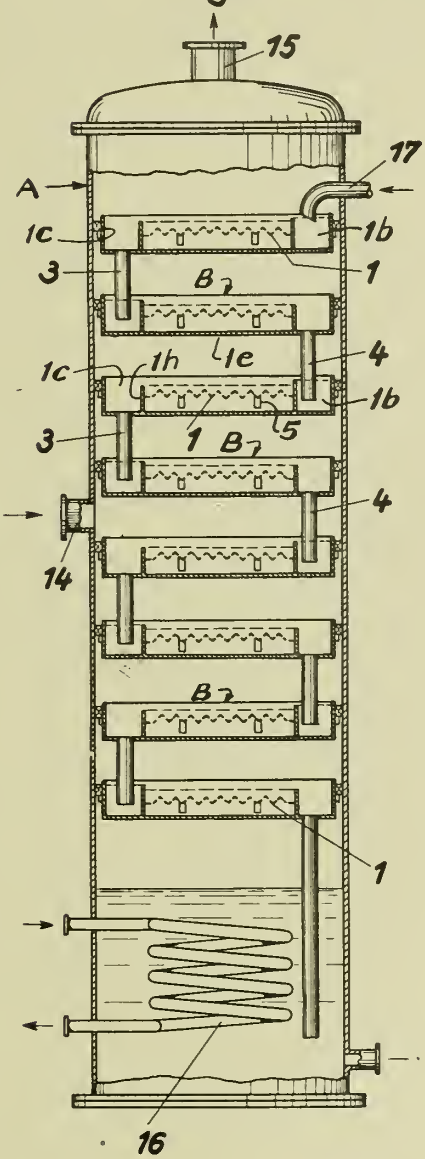
BY A. P. C

H. STOCK
SIEVE-BOTTOMS FOR DISTILLING,
RECTIFYING AND WASHING COLUMNS
Filed Dec. 10, 1940

Serial No.
369,478

3 Sheets-Sheet 3

Fig. 6



INVENTOR
HELLMUT STOCK,

BY Bailey & Larson
ATTORNEYS

Published May 25, 1943 Serial No. 369,686

ALIEN PROPERTY CUSTODIAN

FUEL CONTROL DEVICES FOR FURNACES, MORE PARTICULARLY FOR BOILER FURNACES

Manfred Zoege von Manteuffel, Berlin-Steglitz, Germany; vested in the Alien Property Custodian

Application filed December 11, 1940

My invention relates to improvements in devices for controlling the fuel feed and the supply of combustion air to a furnace, more particularly to a boiler furnace of the type in which any convenient combustion air supply means, such as fans, blowers or the like, are provided for supplying combustion air to the furnace.

In the event of a furnace operating with a load which is reduced—not in the course of the usual load fluctuations—but which remains reduced during a considerable working period, I prefer to correspondingly reduce the performance of the air supply means for the duration of such working period with a view to rendering the working more economical. If two or more fans are provided for supplying air to the furnace, I desire to render inoperative a part of the fans as soon as the performance of the fans remaining in operation is sufficient to supply the combustion air amount reduced corresponding to the reduced load, i. e. corresponding to the reduced fuel feed. At very small loads, at which the natural draught suffices for supplying the combustion air to the fans, all fans or blowers may be rendered inoperative which results in saving of energy for driving the fans.

Such limitation of the air supply performance should be provided independently of the automatic controlling operation of the air supply in response to the furnace load and the furnace load variation. The danger therefore exists of the load responsive fuel feed exceeding the value at which the reduced air supply is adequate.

The main object of my invention is to provide means for eliminating this danger.

Other aims, objects and advantages of my invention will be fully apparent from the following description of one embodiment of the invention as shown in the drawing by way of example only, which drawing schematically represents the essential parts of a controlling device of the kind referred to.

Referring now to the drawing, the combustion air is supplied to the furnace (not shown) through a conduit **1** having one or more orifices **2** for admitting an air flow produced by the natural draught. This draught is however inadequate for medium or greater furnace loads and therefore two fans **3** and **4** are provided for supplying combustion air through the conduit **1** to the furnace. Each of said fans **3** and **4** is driven by means of a steam turbine **5**, **6**, respectively. From a main steam conduit **7** a branch conduit **8** leads to the turbines **5** and **6**. A valve **9** inserted in the branch conduit **8** controls the steam supply to the turbines **5** and **6** in accordance with the boiler load or the furnace load in the manner to be described later on. Beyond the valve **9** a valve **10** is provided for shutting off the steam supply to the turbine **5**, whilst a valve **11** is provided for shutting off the steam supply to the turbine **6**, so that one of the two fans **3** or **4** may be rendered inoperative. Moreover both the valves **10** and **11** may be closed for rendering both fans **3** and **4** inoperative in the event of the natural draught being sufficient for supplying the combustion air required for a very small furnace load.

The means for controlling the valve **9** in response to the boiler or furnace load are described in the following:

The movable valve member **9**a of the valve **9** is connected to the piston rod **12** of a servo-motor **13** controlled in a well known manner by a jet pipe relay **14**, the jet pipe of which is supplied at **15** with a pressure medium, for instance compressed air or oil. In the middle or neutral position of the jet pipe **14** as shown the pressures in the conduits **16** and **17** leading to both sides of the servo-motor **13** are equal, whilst a pressure difference in one or the other direction will be produced by deflecting the jet pipe **14** from its middle position to the right or left. If for instance the jet pipe is deflected clockwise, the pressure in the conduit **17** will exceed that in the conduit **16** causing the piston to further open the valve member **9**a.

For controlling the jet pipe **14** in response to the furnace or the boiler load, an impulse system is provided, shown to be a diaphragm system **18** having a diaphragm **19** dividing the diaphragm casing into two chambers, the lower chamber communicating by means of a conduit **20** with the main steam conduit **7** in front of an orifice plate **22** whilst the upper chamber communicates with the conduit **7** beyond said orifice plate **22** by means of a conduit **21**. Accordingly the diaphragm **19** is acted upon by the pressure drop beyond **22**, this pressure drop being a function of the rate of flow through the conduit **7** and thus a function of the boiler load and the furnace load. The diaphragm system **18** described may be arranged so as to act directly upon the jet pipe **14**. In the embodiment shown, however, the load impulse produced by this system acts directly on another jet pipe relay **23** for controlling a main servo-motor **24**, the piston **25** of which is connected to a piston rod **26** for controlling not only the jet pipe **14** by means of a cam **27** fastened to the rod **26**, but for like-

wise controlling the fuel feed in response to the boiler or furnace load.

In this respect it is to be noted that in the embodiment shown a fuel control valve 29 is inserted in a fuel feed conduit 28 leading to the burners (not shown) in the boiler furnace, the movable valve member 29*a* of the valve 29 being linked to one arm of a double armed lever 30, the other arm of which is pivotally connected to the piston rod 26 so that upon an upward movement of this rod the valve member 29*a* will be further closed and vice versa. At the same time the jet pipe 14 will be deflected counter-clockwise thereby causing the servo-motor 13 to further close valve member 9*a*, i. e. to reduce the performance of the turbines 5, 6 and thus the air supply performance of the fans 3, 4.

The jet pipe relay 23 comprises a well known restoring system having a counter-spring 31 acting on the jet pipe 23 in opposition to the diaphragm 19. This spring rests against an arm 32 fastened to the piston rod 26. An upward movement of the piston 25 caused by a clockwise deflection of the jet pipe 23 results in a decrease of the tension of the spring 31, i. e. in a decrease of the counterforce exerted on the jet pipe 23, whereby it is restored to its middle or neutral position shown in the drawing.

The normal controlling operation of the device described is apparent from the above explanations. If the boiler operates during a considerable period with a load reduced by for instance 50%, either of the two fans 3 and 4 and either of the two turbines 5 and 6 will suffice for supplying the air to the furnace so that with a view to economy the steam valve 11 for the turbine 6 should be closed thereby leaving only the turbine 5 in operation.

As long as the boiler or furnace load fluctuations remain below the 50% value, the operation of the controlling device remains unchanged. Upon a decrease in the load the piston 25 is displaced in the upper range of its stroke and thus controls the valve 29 so as to reduce the fuel feed to about the 50% value referred to above, whilst the valve 9 releases the steam supply to the turbine 5 corresponding to the fuel performance of this turbine, i. e. half the performance of both turbines 5 and 6.

Now if the load exceeds said 50% value, the piston 25 will be displaced downwardly thereby increasing the fuel feed by further opening the valve 29. In the same way a downward movement of the piston 25 results in a further opening of the valve 9 without, however, increasing the air supply, it being understood that the turbine 5 already operates with full performance so that it cannot sufficiently increase the air supply in accordance with the increased fuel feed.

According to my invention I provide means to limit the fuel feed so as to prevent—upon closing of the valve 11—the fuel feed control means from exceeding the value corresponding to the air supply of the fan 3 exclusively remaining in operation. To this end according to the embodiment shown a stop 33 is fastened to the piston rod 26 cooperating with a pawl 34 which is displaceably mounted in bearings 35 so that the pawl may be shifted into the path of the stop 33 in the position shown in the drawing. Upon an upward movement of the piston 25 the stop contacts the pawl 34 before the piston 25 reaches its lowest position. Accordingly the piston 25 cannot fully open the fuel control valve 29 even if the load (i. e. the pressure drop at 22) exceeds the value corresponding to the reduced air supply from the fan 3. The control position of the valve 29 at which the stop 33 contacts the pawl 34 is identical with a fuel feed adequate for the exclusive air supply by the fan 3.

In the special case referred to above in which two fans 3 and 4 are provided and the fan 4 is rendered inoperative by closing the valve 11, the stop 33 should be mounted on the piston rod 26 in such a position that the stroke of the valve member 29*a* reaches its middle position as soon as the stop 33 upon its upward movement contacts the pawl 34. In other words, the adjustment of the position of the stop 33 on the piston rod 26 should correspond to the reduction of the air supply performance by rendering inoperative a predetermined number of fans. Thus, as will be readily understood, the position of the stop 33 must be changed if the two fans have a different air performance or if three or more fans are provided. In this respect it is to be noted that both valves 10 and 11 may be closed for rendering inoperative both fans 3 and 4 if the air supply through the orifices 2 is sufficient, i. e. if the boiler load or the furnace load is materially reduced. In this event the stop 33 on the rod 26 must be approached (in the position of the piston 25, as shown) to the pawl 34 in order to limit the opening stroke of the valve member 29*a* in such a manner that the fuel feed in the contact position of the stop 33 does not exceed the materially reduced air supply value of the natural draught.

With this in view I prefer to provide means by which an adjustment of the stop 33 on the piston rod 26 is easily possible. To this end the stop 33 may according to the embodiment shown in the drawing comprise for instance a bolt 36 screwed into the stop so that after loosening of the bolt the stop may be displaced on the piston rod 26 and again locked in the desired position by tightening the bolt.

Instead of such a displacement a graded stop as shown in Fig. 2 may be used. In this event the terminal position of the piston 25 and the valve member 29*a* may be varied in a predetermined manner by varying the feed movement of the pawl 34; the greater the amount of feed movement, the sooner will the stop contact the pawl, or, in other words, the more the opening stroke of the valve member 29*a* will be reduced. For this reason a graded stop may be particularly useful if three or more fans are provided. In this event a fan may be coordinated to each of the stop grades.

Instead of adjusting the stop 33 on the rod 26 the adjustment of the terminal value may of course be achieved by adjusting the pawl 34 in the longitudinal direction of the rod.

In connection with the working of my new and useful improvement it is essential to take into consideration that the valve 11 should be reopened before or simultaneously with the withdrawal of the pawl 34 in order to avoid that the fuel feed exceeds the value limited by the pawl before the second fan 4 becomes operative once more. This may for instance be achieved by coupling the valve 11 and the pawl 34 by means of a convenient rod system as schematically shown in the drawing so that the valve 11 and the pawl 34 may be simultaneously operated by hand (see the handle 34*a* fastened to the pawl 34).

For the sake of completeness an additional control system for the air supply is shown in

the drawing, this system comprising a butterfly valve **37** in the conduit **1** and a servo-motor **38** connected in a well known manner to actuate said valve in response to the boiler load by means of a third jet pipe relay **39** controlled by a cam **40** secured to the piston rod **26**. In distinction from the control impulse produced by this cam, the jet pipe **39** is acted upon by a second impulse produced by a differential pressure system **41** in accordance with the pressure drop in the air supply conduit **1** beyond an orifice plate **42**.

In a similar manner a counterimpulse is provided for the jet pipe **14** which is produced by a diaphragm **43** in a casing **44**, the right chamber of which communicates with the air supply conduit **1** so that the diaphragm is acted upon by the air pressure in said conduit.

It may be pointed out that the additional air supply control system **37**, **38**, **39** and the means **43** and **44** are unessential as regards the subject matter of my invention and may therefore be dispensed with without affecting fundamentally the working of my improvement.

MANFRED ZOEGE v. MANTEUFFEL.

PUBLISHED

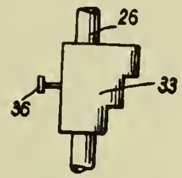
MAY 25, 1943.

BY A. P. C.

M. Z. VON MANTEUFFEL
FUEL CONTROL DEVICES FOR FURNACES, MORE PARTICULARLY FOR BOILER FURNACES
Filed Dec. 11, 1940

Serial No.
369,686

Fig. 2



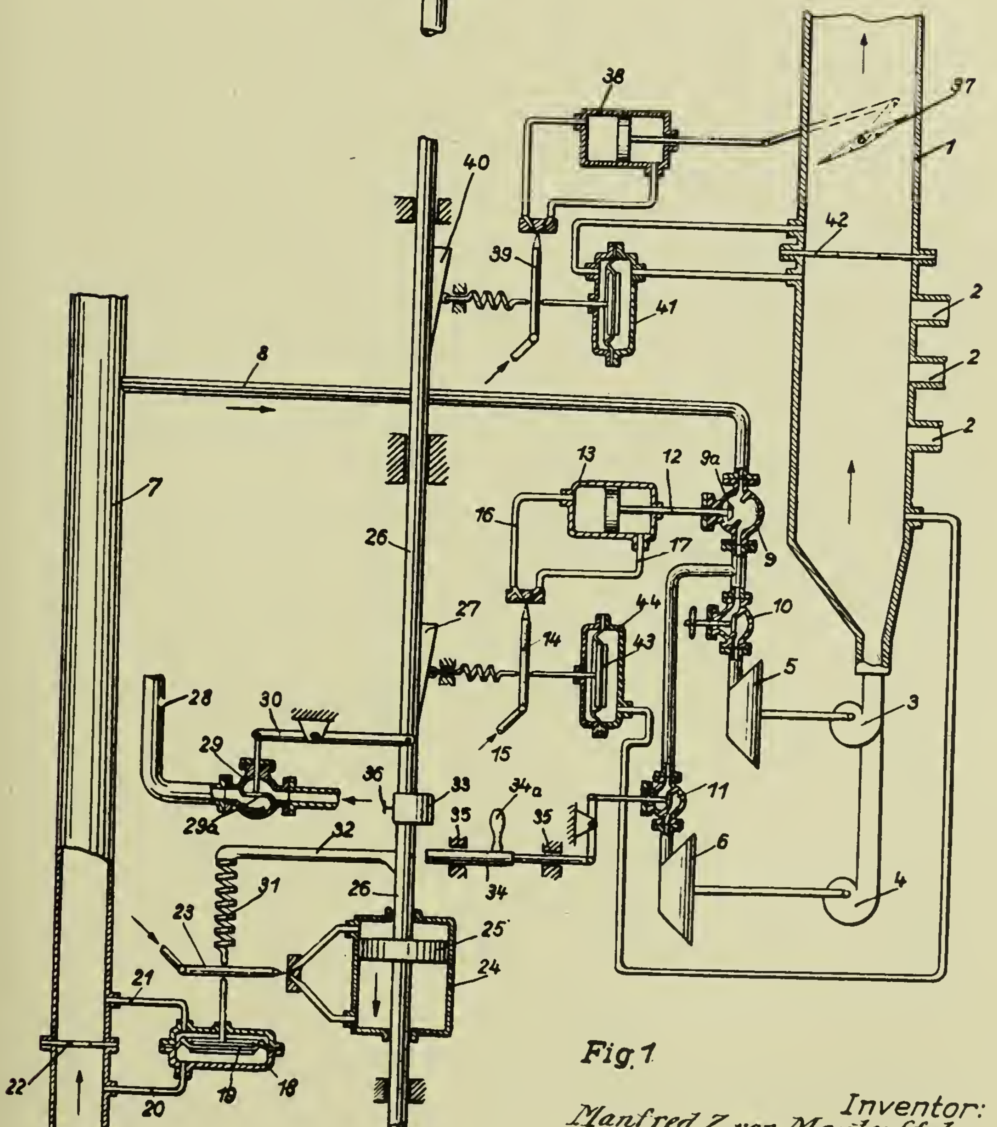


Fig. 1

Inventor:
Manfred Z. von Manteuffel

By A. D. Adams
Attorney

Published May 25, 1943

Serial No. 370,154

ALIEN PROPERTY CUSTODIAN

TAXIMETERS OF THE TYPE USED IN PUBLIC CONVEYANCES

Paul Riegger, Villingen/Schwarzwald, Germany; vested in the Alien Property Custodian

Application filed December 14, 1940

This invention relates to improvements in taximeters of the type used in public conveyances, such as taxicabs, for the purpose of registering the fare and indicating whether the conveyance is "hired" or "vacant".

It already has been suggested to provide means in taximeters of the type referred to for mounting the portion of the device indicating whether the taxicab is "hired" or "vacant", at a conspicuous point of the craft separately from the fare registering device, and to provide electrical connecting means between the separate indicator and the fare registering device, for simultaneously operating the indicator and the fare registering device to adjust either of two positions, i. e. "hired" or "vacant".

It is an important object of the invention to provide connecting means, which permit adjustment of the indicator to more than two positions, for indicating the tariff registered by the taximeter, so as to readily enable the police or the inspectors of the operating company as well as the passenger to ascertain whether the prescribed tariff has been switched in.

With these and further objects in view, as may become apparent from the within disclosures, the invention consists not only in the structures herein pointed out and illustrated by the drawings, but includes further structures coming within the scope of what hereinafter may be claimed.

The character of the invention, however, may be best understood by reference to certain of its structural forms, as illustrated by the accompanying drawings in which:

Fig. 1 is a rear elevation of the fare registering device and the indicator, as viewed from a point outside the car.

Fig. 2 is an elevation showing the side of the indicator facing the driver or the passenger in the car, respectively.

Fig. 3 is an elevation, partly in an axial section, of the indicator, on a larger scale.

Fig. 4 is a cross sectional view of the same indicator, on a similar scale as Fig. 3.

Fig. 5 is a side view, showing a modification.

Fig. 6 is a perspective view showing one mode of mounting the device in the taxicab.

Similar characters of reference denote similar parts in the different views.

As here shown, I provide a mechanical transmission gear, preferably including a flexible shaft, between the switching lever of the fare registering device and the indicator, for controlling the indicator in accordance with the various "vacant" and "hired" positions of the switching lever corresponding to the tariff applying at that time. These mechanical transmitting means permit the adjustment of the indicator, for instance, to tariff "1", tariff "2" or tariff "3", by simple, robust and reliable means. Moreover, where the indications of the indicator have to be changed in accordance with alterations of the tariff regulations, this may be effected by merely interchanging the indicating member, for instance, a drum member bearing the various indications and mounted to turn in a housing, while it is not required to exchange the gear system itself. For example, if the switching lever of the fare registering device has four positions, the circumference of the indicator drum will be divided into four equal parts.

Referring now to the drawings in greater detail, the fare registering device 2 is provided with a switching lever 1, which serves to switch off the driving gear of the device ("vacant" position) or to switch in any one of a number of tariffs. By turning the lever 2, a pinion 4 on the lever shaft 3 is rotated, transmitting its rotation, through intermediate gears 5, to a worm wheel 6 meshing with a worm 7. The worm 7 in turn is operatively connected with a flexible shaft 8 arranged between the fare registering device 2 and the indicator 9, whereby the switching motion is transmitted from the switching lever 1 through the gears and flexible shaft to a gear system within the indicator casing 9.

As will be noted from Figs. 3 and 4, a drum or cylinder 10 is turnably mounted in the cylindrical indicator casing 9, on a shaft 11, a face wheel 12 of which meshes with a pinion 13. The shaft 15 of the pinion is supported in a bearing 14 and operatively connected to the flexible shaft 8. Thus, the switching motions of the handle 1 are mechanically and positively transmitted to the drum 10 which may be moved into different positions in its casing 9 under control of the lever 1.

The casing 9 is formed with diametrically opposed apertures 16 and 17 which may be closed by transparent glass plates or the like. The casing may be secured by means of its holder bar 18 in the interior of the car 23, Fig. 6, at the lower frame portion 25 of the wind guard 24, the larger window 16 of the indicator 9 thus being visible from the outside, while the smaller window 17 faces the inside of the car.

The various characters ("vacant", tariff "1", tariff "2", tariff "3") are provided on the drum 10 in duplicate, on diametrically opposed points 10' and 10'' thereof, as best seen on Fig. 4, for simultaneous display through the opposite windows

16 and 17. Therefore, if the drum by suitable adjustment of the switch lever 1 is adjusted, e. g., to "tariff 1", the character "tariff 1" or simply "1" will appear at the forward window 16 as well as at the rearwardly and inwardly directed window 17. For the sake of clarity, the tariff positions may be indicated in the large window 15 by points p rather than by figures.

It is desirable to make the hollow cylinder 10 bearing the characters to be displayed from a transparent material so that the characters to be indicated may be illuminated by an electric bulb 19 centrally disposed within the drum 10.

By way of alternative, the drum 10 may be replaced by a rotary disc 20, Fig. 5, disposed in a casing 22 behind opposite windows 21 thereof, and bearing the characters "1", "2", "3" etc. on its opposite faces. The gear system between the flexible shaft 8 and the disc 20 in this case may be arranged in the same manner as indicated in Figs. 3 and 4, except that the longitudinal drum 10 is to be substituted by the flat disc 20, the axis of rotation of which will be directed parallel to the longitudinal axis of the car contrary to the axis of rotation of the drum 10, being disposed transversely in the car according to the arrangement shown in Fig. 6.

The method and apparatus of the present invention have been described in detail with reference to specific embodiments. It is to be understood, however, that the invention is not limited by such specific reference but is broader in scope and capable of other embodiments than those specifically described and illustrated in the drawing.

PAUL RIEGGER.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

P. RIEGGER

TAXIMETERS OF THE TYPE USED IN PUBLIC CONVEYANCES

Filed Dec. 14, 1940

Serial No. 370,154

3 Sheets-Sheet 3

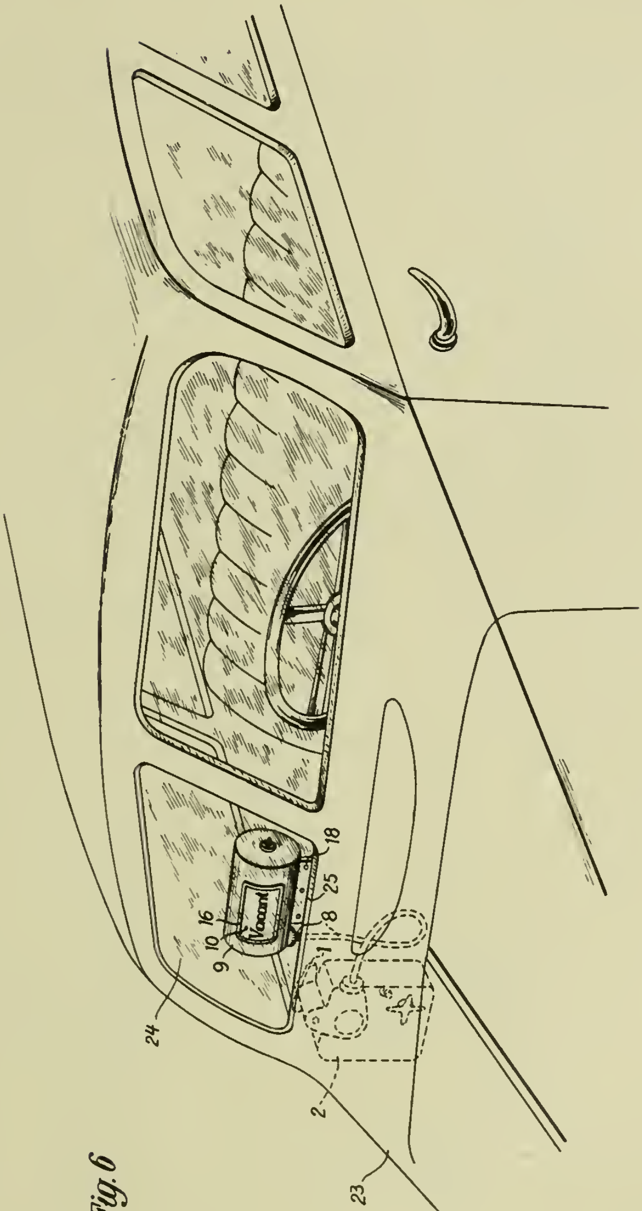


Fig. 6

Inventor:
PAUL RIEGGER
by
Attorney:
Harold D. Penney

PUBLISHED

MAY 25, 1943.

BY A. P. C.

P. RIEGGER

TAXIMETERS OF THE TYPE USED IN PUBLIC CONVEYANCES

Filed Dec. 14, 1940

Serial No. 370,154

3 Sheets-Sheet 2

Fig. 3

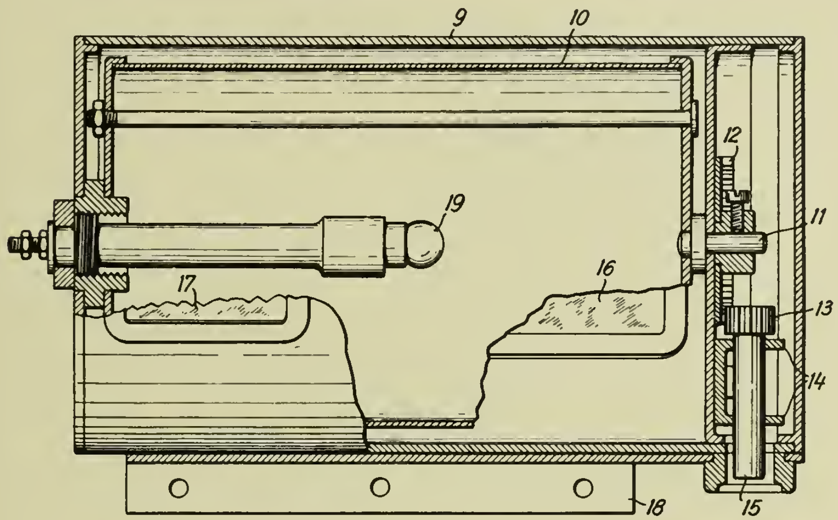


Fig. 4

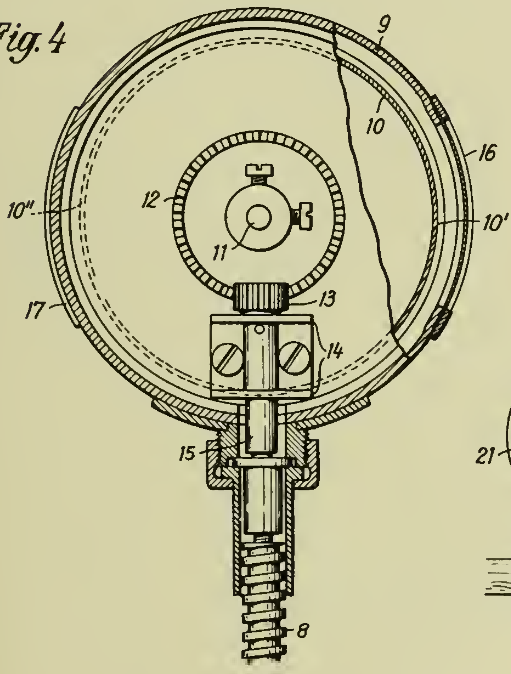
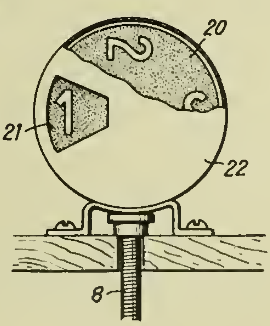


Fig. 5



Jnventor:
PAUL RIEGGER
by

Attorney:
Harold D. Penney

PUBLISHED
MAY 25, 1943.
BY A. P. C.

P. RIEGGER
TAXIMETERS OF THE TYPE USED
IN PUBLIC CONVEYANCES
Filed Dec. 14, 1940

Serial No.
370,154
3 Sheets-Sheet 1

Fig.1

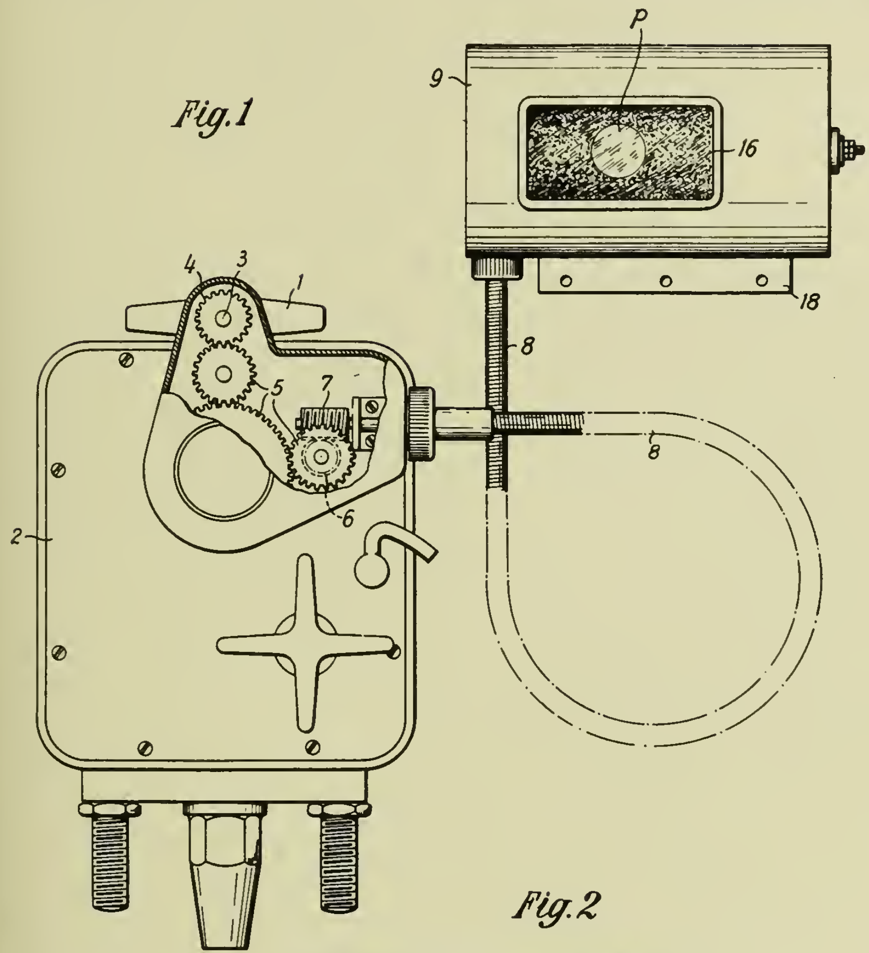
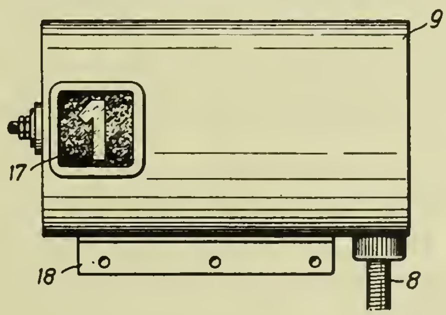


Fig.2



Jnventor:
PAUL RIEGGER
by
Attorney:
Harold D. Penney

Published May 25, 1943

Serial No. 370,548

ALIEN PROPERTY CUSTODIAN

DEVICE FOR HOLDING SLIPS OR THE LIKE, FOR ACCOUNTING SYSTEMS OR STATISTIC REGISTRATIONS OR SIMILAR RECORDS AND THE RESPECTIVE APPARATUS FOR CUTTING THE SLIPS

Mario Pigni, Milan, Italy; vested in the Alien Property Custodian

Application filed December 17, 1940

The subject-matter of this invention is a device for holding slips or the like for accounting systems, statistic registrations or similar records and the respective apparatus for cutting the slips.

The use of cards for accounting or statistics for copying the variations of goods, articles, or other sizes that can change in any, is well known.

However, to compile and draw up such cards requires a good deal of time, and besides this work of this kind always leads to mistakes in computation, copying and the like, which even the most expert and careful people are liable to make. The foregoing is due to the fact that this kind of work is undoubtedly of a mental nature in as much as only recopying, sorting and copying of groups of figures in the order and successions required, are being dealt with.

The aim of invention is to do away with this source of mistakes by changing the exclusively mental work into manual work, which is therefore less subject to errors, and even if this should not happen for accidental causes or others, the said mistakes could easily be put right.

According to the invention, the device calls for at least one supporting plate or the like, fitted up in such a way as to receive on one or both its surfaces, but preferably with the possibility of removal, at least one set of strips or slips arranged one under the other beforehand so as to facilitate their sorting and the arithmetical operations of the different particulars.

In one advantageous form of performance the supporting plate has means, preferably metallic, to hold back the different slips, and such means have holes or slots to allow orderly filing through same and to also allow the said slips to be removed.

The fixing means can consist of bulging parts or projections made in the supporting plate, or of metal discs or strips fixed to the aforesaid plate in such a way that they jut out from same to receive the slips which are held by removable spring stops and they cooperate with the said bulging parts to allow the slips to be moved. These fixing means may consist of metallic tongues fixed or obtained from the supporting plate and suitable to hold back the slips, which are locked by means of the bending of the said tongues although it is not excluded that they can be glued.

The slips can be obtained advantageously by tearing along the perforated folds of one or more sheets of paper compiled at the same time, by means of copying by tracing, with at least one sheet compiled to receive the list of the different items to be computed or to be signalled in their movement; the said slips, after being compiled and separated, are placed on the respective supporting plates. If the sheets of paper should not have perforated folds or the like, they can be reduced to slips with an apparatus having in combination a supporting and placing tablet, means for fixing the sheets to be cut, as well one or more cutting organs, eventually provided with pressing means for the said sheets to be cut.

In another advantageous form of performance the tablet or the like is provided with moveable spring rules for placing and fixing the sheets to be cut, on the upper surface of which parallel grooves are made at a suitable distance from each other for the purpose of guiding one or more cutting blades.

When there are several cutting blades, these are entrusted to a slide with guiding means provided by the tablet and one or more spring rollers that press on the sheets and these cutting organs can be raised automatically to remove and place the sheets in their proper place.

Eventually the tablet can have means to glue the single slips so that they are fixed on supporting frames and the like.

The invention will now be explained but only as an indicating example and not to confine the extent of the invention, with reference to the annexed drawing which illustrate supporting plates or cards, with the respective slips, particularly, but not exclusively suitable for use in accounting operations or statistics and the apparatus for obtaining such slips.

Fig. 1 is a raised view of a card with slips kept back by means of movable organs.

Fig. 2 is the section on a larger scale.

Fig. 3 is a part view of a variation.

Fig. 4 is the respective section.

Fig. 5 shows a form of performance, with parts removed, of the slips to be compiled in three copies.

Fig. 6 is a perspective part view of a first form of the apparatus.

Fig. 7 is a raised side view.

Fig. 8 is a cross section.

Fig. 9 is a lengthwise part section of a variation of performance according to Fig. 6.

Fig. 10 is a lengthwise part section of the other end according to Fig. 9.

With reference to Figures 1 and 2, card **10**, which can be made of suitable material (thin cardboard, metal, etc.) has at a suitable pitch, two or more sets of holes which keep back the

discs 11 fixed to the card with glue or owing to the bending of wings coming from the said discs from where come the projections 12 suitable to lock with holes 13 (see Fig. 5) in the slips 15. The spring stops 14 then engage with the said projections; these stops consist of for instance discs having elastic lamellae which press elastically on projections 12 so as to keep back slips 15 and to allow them to be removed at the same time.

In Figures 3 and 4, card 10*a* provides to have the slips fixed to it by means of the bending of metal tongues 16 obtained from a fillet 17 and fixed to the said card or by means of hooks or the like. If the cards 10 should be made of metal, it is not to be excluded that the means for keeping the slips back can be advantageously obtained direct from the said cards. Arrangement of the slips on the latter can take place according to the requirements called for by practice in use. For instance the card illustrated in fig. 1 requires a space 20 above to receive the headings of the subject of statistics or the like. whereas space 21 with suitable divisions, is to head the columns concerning the particulars written on the slips, and regarding for instance, the date, place or similar details, the amount sent out or taken in, or the Cr. and Dr. items and the notes to be pointed out.

Fig. 5 illustrates a very advantageous form of realisation for the different slips drawn up in three copies in the example illustrated, but the number of the said copies can vary in any way in practice. The sheets in question can be loose or grouped together in a swatch and between each sheet and the following one, a sheet of tracing paper is put for copying at the same time on the remaining sheets 25′ and 25″.

In this way and by compiling sheet 25 the movement is registered in space 26 of the items to be checked (goods, money, etc.) during determined times and the respective number values are written in space 27. The sheets 25′ and 25″ following the first, or other similar sheets have the same interlining with each other and crosswise the said sheets have perforation 28, so that they can be torn off for the purpose of obtaining the slips 15.

To allow compilation at the same on one volume only of the different numerical sizes, (either positive or negative) to again have either amount taken in or sent out, etc. one or more of the sheets 25′ and 25″ have a fold 29 so that the folded sheets are shorter than the previous ones. This fold is done away with when the slip is applied on the supporting card 10 (see Fig. 1), so that it comes back to the same length of the other slips and the different positive or negative value are found in columns with the respective supporting columns 10, so as to make the required computations easy.

It is clear that there is no difficulty in compiling the said sheets and when this operation is finished, the different slips are detached and then placed on their cards. To make this operation easy, the said sheets can be of different colours to do away with any chance of mistakes in this way. According to the length of slip 15 one or more series of means can be provided (tongues, discs, etc.) for keeping them back and fixing them. Such means can be presented by both surfaces of support 10 and they can be replaced if necessary according to other forms commonly used. Fixing of the slips to supports 10 with glue is not to be excluded.

With reference to Figures 6 to 8, a wooden tablet 110 or something to take its place, has the side hinged 111 for a metal rule 112, which by means of return springs 113 keeps the sheets F to be cut, pressed. The metal points 114 on which sheets F are filed to be further held during cutting, are fixed in tablet 110 in correspondence with the rule 112.

A cross-piece 115 runs lengthwise to tablet 110 and it carries a set of knives of a suitable shape fixed to a shaft 117 preferably with a polygonal section hinged in sides 118 of the aforesaid cross-piece. These sides have the guide projections 119 running in grooves 120 made sidewise to tablet 110, so that cross-piece 115 is kept in order during use. Shaft 117 is in one with arms 121 acted upon by springs 122 which make it revolve in the direction of the arrow to raise knives 116 which take the position given by the dots in Figure 8. Arms 121 terminate with the side appendixes 123 provided with rollers engaging with hollows 124 having a suitable course. Sheets F are kept pressed by a roller 125 supported by sides 118 of the cross-piece 115 and acted upon by springs 126. A series of parallel grooves 127 is made crosswise in tablet 110 and they are pitched between each other by the width of each slip, and these grooves allow the points of knives 116 to come out to obtain a complete cut of the slips and a further guide for knives 116.

The use of the apparatus is evident: to arrange sheets F on tablet 110, it is sufficient to bring cross-piece 115 to the end of the run to have knives 116 rise to disengage arm 121 from the hollows 124. Rule 112 is raised to engage the sheets with points 114. By moving cross-piece 115 the knives are lowered in the beginning and by continuing the sheets are cut into slips. The apparatus can be completed with a basin 130 for a sponge 131 so that if the slips should become fixed by gluing to the card or the like, the operation can be made much easier with use of the said sponge.

The variation according to Figures 9 and 10 provides for the slips to be cut one by one by means of one knife only 116*a*, which can be changed completely, with a manoeuvre handle 115*a* and combined with a roller 125*a* for pressing the sheets F.

In this case and to make it easier to insert the knife in the proper position in one of the grooves 127*a*, notches 135 are provided for along the lengthwise element making up rule 112*a* and on its internal side and these notches correspond with grooves 127*a*. In this way and by resting with 116*a* in notch 135, cutting of the sheets is started and the said blade is guided in the rest of its course along groove 127*a*.

At the moment of cutting sheets F can be held tightly by the other side too and lengthwise when the said sheets are cut slip by slip. In conformity with Fig. 10 is arranged for this purpose that the ends of sheets F are held back by an auxiliary rule 140 hinged to tablet 110*a* and ending with a square appendix 141 provided with cuts 142 for the passage of the blade. Lamellar springs 143 or the like press the slide and hence sheets F. these springs being disengaging for the auxiliary rule 140 to replace the sheets. With this end in view the said auxiliary rule is acted upon by springs 114, which remove it from the contact of the sheets.

Eventually the auxiliary rule 140 can be hinged to tablet 110*a*, instead of in the outside part, as shown in Fig. 10, with two arms which move

away in cuts in the ends of the said tablet, so that when rule 140 is raised, it is kept raised by a suitable stop device and it is easier to replace the sheets F to be cut in this way.

The apparatus according to Figures 6 to 10 can have other uses besides those under consideration here; for instance to cut accounting sheets into strips, as well as sheets of paper, etc., made out with the tracing system or the like.

The apparatus can be completed with the most suitable means of engaging and disengaging for the cross-piece 115 and the grooves 127 can have metal sides; the tablet 110 too can have pins or projections for meeting and housing the sheets to be cut.

Other modifications of the details above mentioned may also be used without departing from the spirit and scope of the invention.

MARIO PIGNI.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

M. PIGNI

DEVICE FOR HOLDING SLIPS OR THE LIKE, FOR ACCOUNTING SYSTEMS OR STATISTIC REGISTRATIONS OR SIMILAR RECORDS AND THE RESPECTIVE APPARATUS FOR CUTTING THE SLIPS

Filed Dec. 17, 1940

Serial No. 370,548

2 Sheets-Sheet 1

FIG. 1

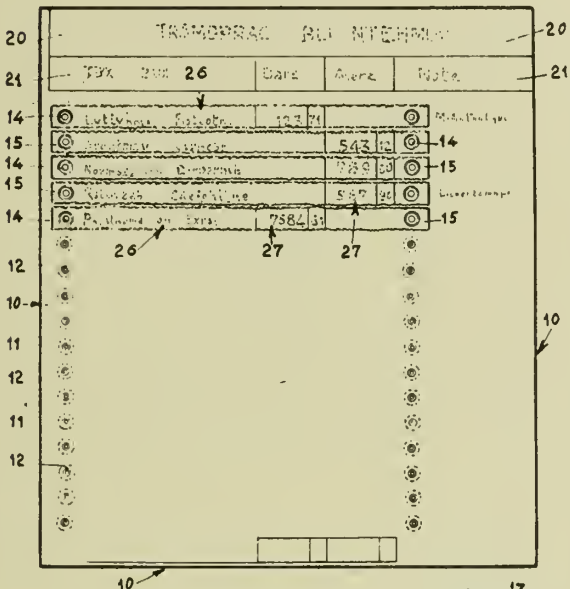
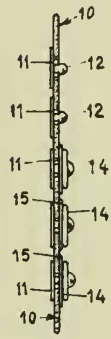


FIG. 2



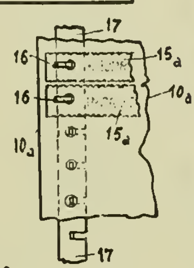


FIG. 3

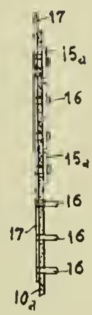
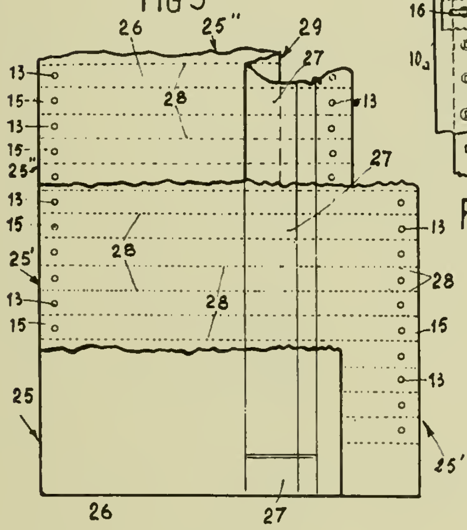


FIG. 4

FIG 5



Inventor
Mario Pigni
by Sommers-Young
Attorneys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

M. PIGNI

DEVICE FOR HOLDING SLIPS OR THE LIKE, FOR ACCOUNTING SYSTEMS OR STATISTIC REGISTRATIONS OR SIMILAR RECORDS AND THE RESPECTIVE APPARATUS FOR CUTTING THE SLIPS

Filed Dec. 17, 1940

Serial No. 370,548

2 Sheets-Sheet 2

FIG. 6

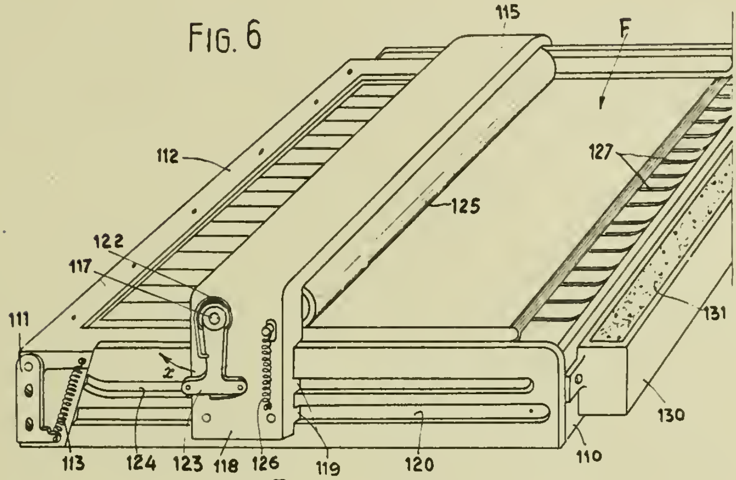


FIG. 7

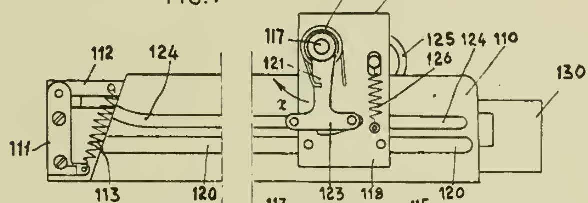


FIG. 8

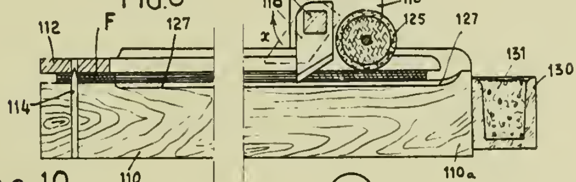


FIG. 10

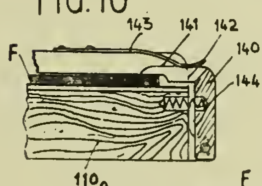
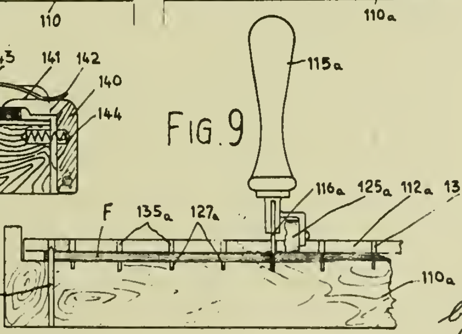


FIG. 9



Inventor
Mario Pigni
by Sommers & Young
Attorneys

Published May 25, 1943

Serial No. 372,013

ALIEN PROPERTY CUSTODIAN

SEPARATOR

Wilhelm Wilsmann, Oelde, Germany; vested in the Alien Property Custodian

Application filed December 27, 1940

This invention relates to separators for liquids provided with centrifugal pumps. In the known machines of this class in which the pump wheel is connected with the drum or with the hollow spindle the tight closure against the drum is effected by packings or the like. When using the said tightening means in machines having a great number of revolutions disturbances through drainage occur as soon as the liquid feed to the drum is temporarily interrupted.

The primary object of this invention is a construction by which the said drawbacks are avoided. The improved separator is provided with a centrifugal pump arranged axially beside the drum, whereby the wheel of the pump is connected with the drum or the hollow spindle, and the pump space axially adjacent the pump wheel and surrounding the pump wheel shaft is tightened against the latter by means of a stationary annular chamber filled with liquid and separated from the pump space by a special front wall and by an annular body dipping into the liquid in the said annular chamber, the said front wall having an inner opening for the passage of the pump wheel shaft, which opening is of smaller diameter than that of the pump wheel.

Other objects of this invention are set forth in the following specification.

A feeding device on the drum for separated liquid contents and the tightening by means of a liquid seal has already been proposed. In the known arrangement a feed worm is used which only engenders a small feed pressure and which needs for this reason only a small tightening pressure. The dipping annular body is radially positioned outside of the feed worm and around the head of the drum, and a large annular gap has to be tightened. The device consumes much power, and the direct connexion of the tightening chamber with the radially remotest space of the worm chamber and the simultaneously proceeding maximum of rotating speed causes a permanent breaking and mixing of the liquid goods with the tightening liquid.

In the accompanying drawings several embodiments of the invention are illustrated.

Fig. 1 shows a separator with a feed pump and an annular tightening body beneath it, the said elements being arranged above the drum of the separator which has a stripper for the heavy liquid components and free discharge for the light liquid components.

Fig. 2 shows a modification with another inlet to the drum.

Fig. 3 shows a modification with reversing leading blades screened by a wall and with a throttle valve, in combination with two strippers.

Fig. 4 shows a separator having the inlet to the drum through the hollow spindle from below and a second arrangement for the discharge of the liquid on top of the drum.

Fig. 5 shows a separator with another arrangement of the means for tightening the pump space against the pump wheel shaft and

Fig. 6 shows a modification of the construction according to Fig. 5.

According to Fig. 1 the liquid flows through the inlet 1 into the chamber 2 and from there into the pump wheel 3. The liquid is fed along the stationary leading blades 4 and the central inlet tube 5 into the drum. The heavy liquid components such as skimmed milk flow to the periphery of the drum and from there through conducts 7 and 8 to the stripping chamber 9 from which the said liquid components are pressed by the stripper 10 to the outlet 11. The inlet tube 5 centrally passes the stripper 10 which latter forms a circular body concentric about the axis of rotation. By this arrangement a small diameter of the pump and a limited space of the assembled parts is attained, so that the elements for the inlet and for the outlet are close together. The light liquid components consisting especially of cream flow towards the centre and from there over the weir 12 to the free discharge from the drum at 13. In consequence of the arrangement of the ducts 12 and 14 having a greater radial distance from the centre the liquid flow radially passing the drum might break off in the inlet tube 5, and for avoiding such a breaking and for keeping the said tube always completely filled radial interruptions 15 and 16 for the ducts of both the skimmed milk and the cream are provided. When radially passing the said interruptions the liquid rotates there due to its inertia with a velocity towards the outside which is greater than that in the zones beneath of said interruptions, in which zones the liquid flow is radially guided, and in consequence of this fact the liquid is forced in the said points towards the outside. From the lengths of the chambers 15 and 16 the magnitude of the over-pressure depends.

The chamber 2 is arranged around the pump wheel shaft and beside the pump wheel. The said chamber is tightened against the pump wheel shaft 19 by a stationary annular chamber 17 filled with liquid and by a rotating annular body 18 dipping into the liquid in the said chamber. For this tightening the liquid may be used which is subjected to separation, as the annular chamber

17 is automatically filled with the said liquid. But in special cases other tightening liquids may be used such as mercury or water for the centrifuging of benzine. The side of the annular body 18 adjacent the chamber 2 is provided with driving wings 20 which act against the vacuum in the annular gap of the chamber 2. The same effect may be attained by providing locking wings on the lower wall of the annular chamber. But also both of the said different sorts of wings may be used for raising the effect. In the case that the liquid to be centrifuged is fed to the inlet 1 with such a pressure that the vacuum in the annular gap is canceled, a smooth annular chamber and a smooth annular body suffices, and in the case of a highly augmented pressure and an over-pressure existing in the annular gap the driving and locking wings may be used in a reversed arrangement.

Fig. 2 shows a similar arrangement, but the centrifugal pump is here provided with a central inlet 21. The liquid flows over leading ribs 22 and apertures 23 into the inlet tube 5. As in this case the annular chamber together with the annular body rotating in this chamber tightens against the pressure space of the pump, the ribs or wings are here in all cases necessary as in the case previously described, according to which pressure exists in the inlet duct.

Fig. 3 shows an arrangement substantially corresponding with that of Fig. 1. But according to Fig. 3 the leading blades 4 are screened against the pump wheel by an annular wall 24. By means of a valve 25 the pressure side of the pump may be locked and adjusted for a pre-determined passage of liquid. The discharge of the liquid components is here effected by two strippers. The radial interruptions of the liquid feed for avoiding the breaking of the liquid flow are here arranged in the inlet duct at 26. A break may also be avoided by narrowing the cross-section as shown at 27. The narrowed passage 27 has to be arranged in the radial direction at least in the height of the discharge for the separated liquid.

Fig. 4 shows the construction according to the invention in application for the inlet and the outlet of the liquid to be centrifuged. The inlet is executed through the hollow spindle from below and the outlet from the drum is above the latter. On the inlet the tightening chamber mostly tightens against a vacuum, and on the outlet for the liquid the said chamber tightens against pressure, and correspondingly the driving ribs or wings must be on the dipping body, whereas the locking ribs are on the annular chamber. The drum according to Fig. 4 is especially adapted for purifying oil. The purified oil is lead off by the upper pump, whereas the separated water has a free outlet over the weir 28.

The application of the invention is not limited to the described examples. The pump for the inlet and one or several pumps for the outlet of the same construction may be arranged on the same side of the drum. The new device may in any desired number be provided for an open inlet only for the frothless discharge or for a frothless inlet in drums with open outlet. The construction according to the invention may be used in combination with all known inlet and outlet arrangements. The inlet tube or the outlet tubes with the pump wheels may be fixed either to the distributor or to the separating plate, to any inserted element, to covers or partitions of the drum, to hollow spindles or to other elements.

When using a closed inlet a liquid meter is preferably provided, whereby the inlet controlling device is arranged between the meter and the pump. The indication of a meter arranged between the controlling device and the pump is often vibratory.

When using corresponding liquid tightening means the pump is of a good sucking capacity so that the liquid to be centrifuged is also sucked through apparatus arranged in front of the pump. A pumping necessary in a manufactory may under circumstances be effected by the separator itself. Additional pumps are ordinarily not necessary.

When feeding the liquid through the hollow spindle according to Fig. 4 the worm of the driving gear is rigidly mounted, and the hollow spindle of the drum passes through said worm. The driving worm may then also be held against axial movement. A hold against axial movement is always necessary when globoid-worms are used.

The hollow spindle of the drum may be mounted with its upper portion in an independent bearing of known construction and with its lower portion either in the jacket of the worm or in special bearings. Between the jacket of the worm and the spindle of the drum the known connections are provided which allow osciilatory movements.

According to Fig. 5 the means for tightening the pump space against the pump wheel shaft are reversed in kinematical respect to the tightening means shown in Figs. 1–4 which are otherwise of the same construction and operation. According to Fig. 1 the annular chamber 17 is stationary and the annular body 18 is rotating. But according to Fig. 5 the annular chamber 30 is rotating, as the same is rigidly connected with the rotating hollow spindle 31 of the separator. The annular body 32 dipping into the liquid in the chamber 30 is stationary. Inside of the annular chamber the rotating part 38 has on the side facing the liquid gap 34 means 36 for driving the liquid and on the side facing the air gap 35 means 37 for checking the liquid motion. In many cases either only the driving means or only the checking means may be used. The said driving and checking means are necessary in the case that a vacuum exists in the inlet space 39. In the case that an over-pressure exists an adjustment may take place according to which the driving and checking means are unnecessary, and in the case of a considerably raised inlet pressure a reversed arrangement of the checking and driving means may take place.

Fig. 6 shows a modification according to which the rotating annular chamber 40 surrounds the stationary pump body 41.

The opening in the front wall through which the pump wheel shaft passes has a diameter smaller than that of the pump wheel, and the tightening means are outside of the liquid flow.

A stripper may be arranged in rear of the pump.

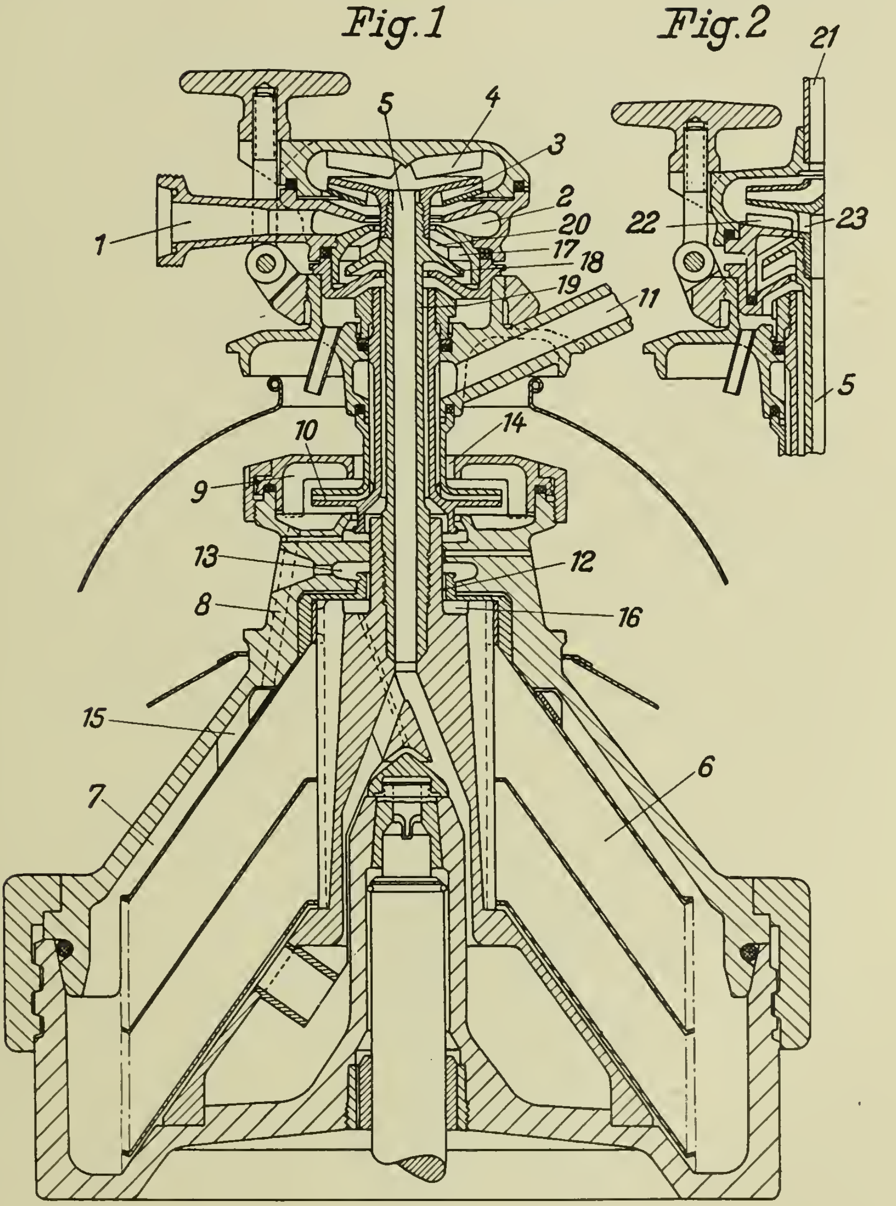
WILHELM WILSMANN.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. WILSMANN
SEPARATOR
Filed Dec. 27, 1940

Serial No.
372,013
5 Sheets-Sheet 1

Fig. 1 Fig. 2



Inventor:
Wilhelm Wilsmann
By Lacey & Lacey,
Attorneys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

W. WILSMANN

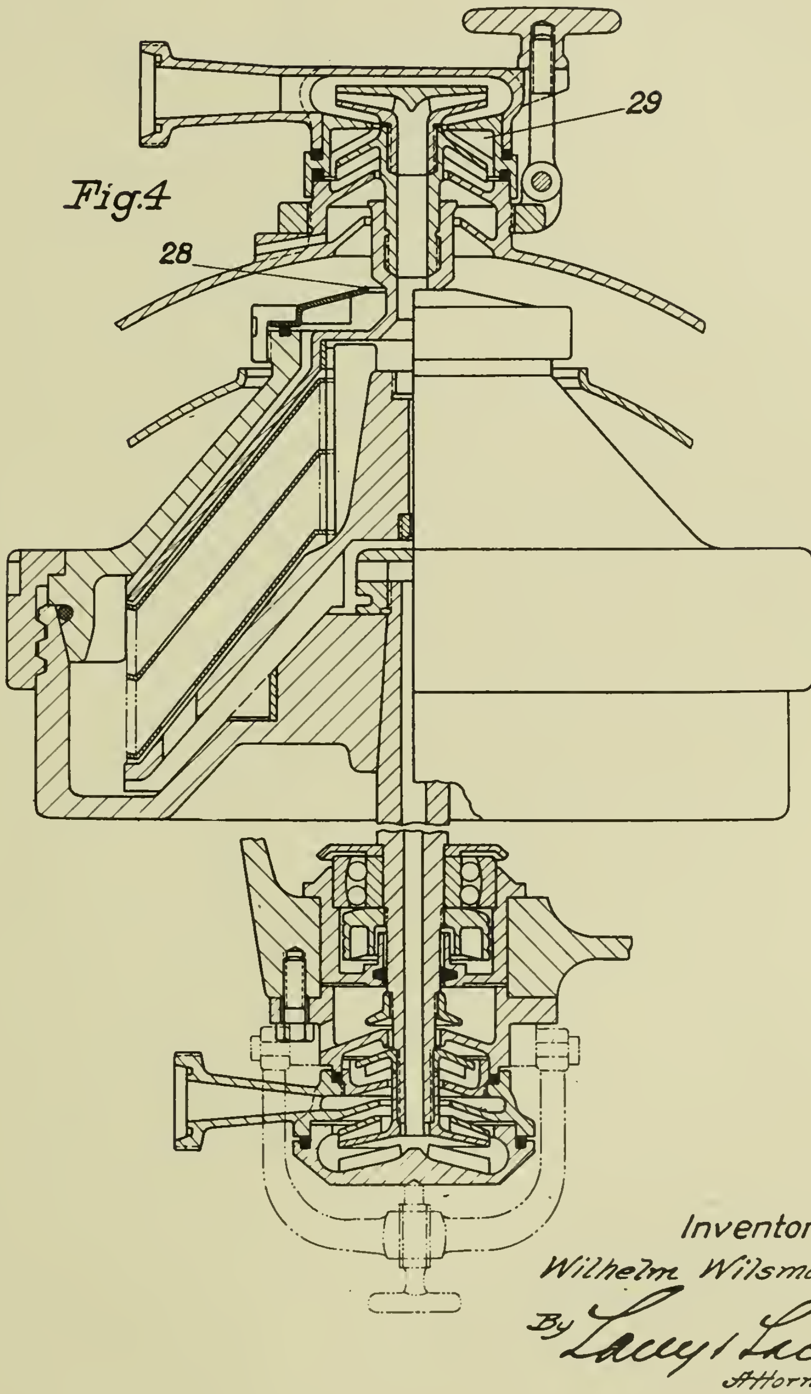
SEPARATOR

Filed Dec. 27, 1940

Serial No. 372,013

5 Sheets-Sheet 2

Fig.4



Inventor:
Wilhelm Wilsmann
By Lacey & Lacey
Attorneys

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. WILSMANN

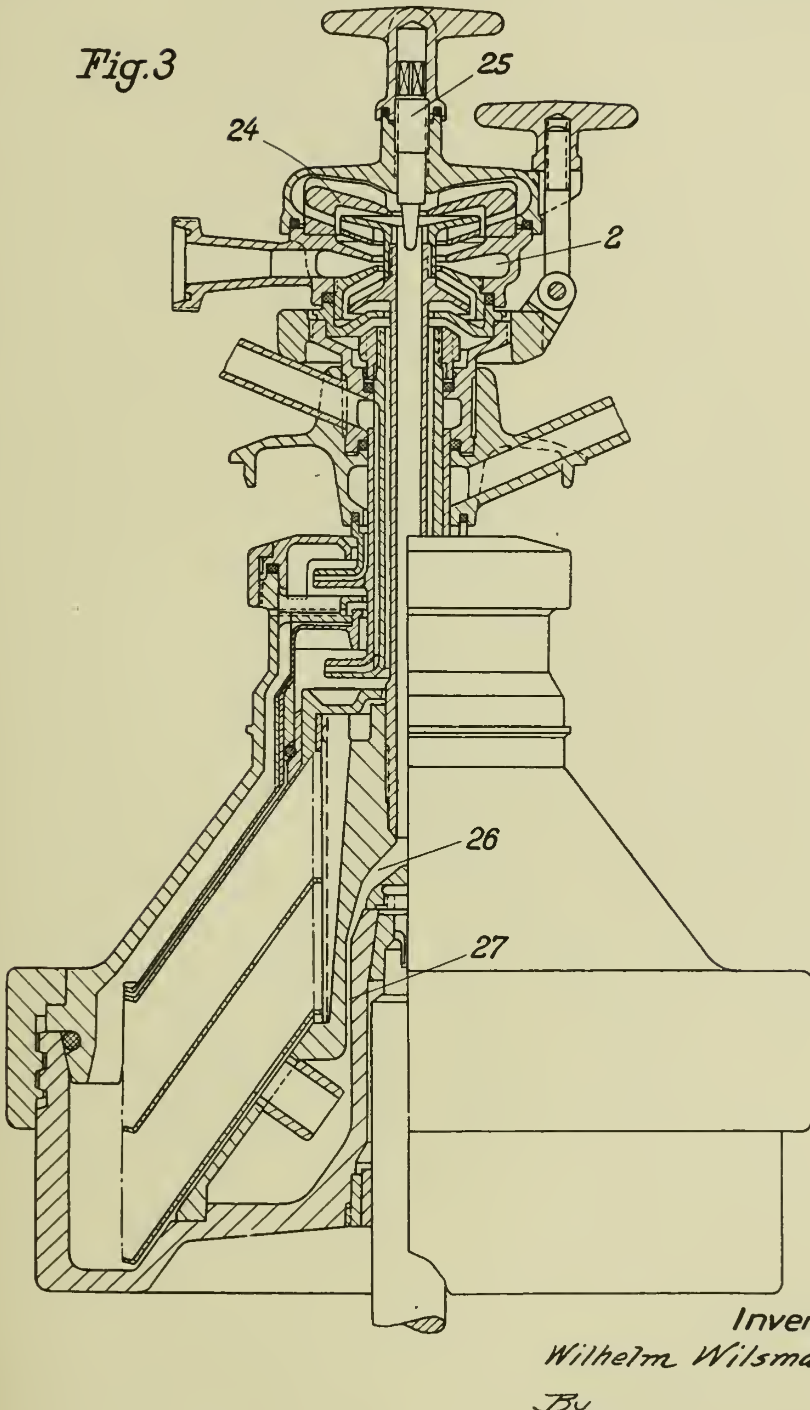
SEPARATOR

Filed Dec. 27, 1940

Serial No.
372,013

5 Sheets-Sheet 3

Fig. 3



Inventor:
Wilhelm Wilsmann
By
Attorneys

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. WILSMANN
SEPARATOR
Filed Dec. 27, 1940

Serial No.
372,013
5 Sheets-Sheet 4

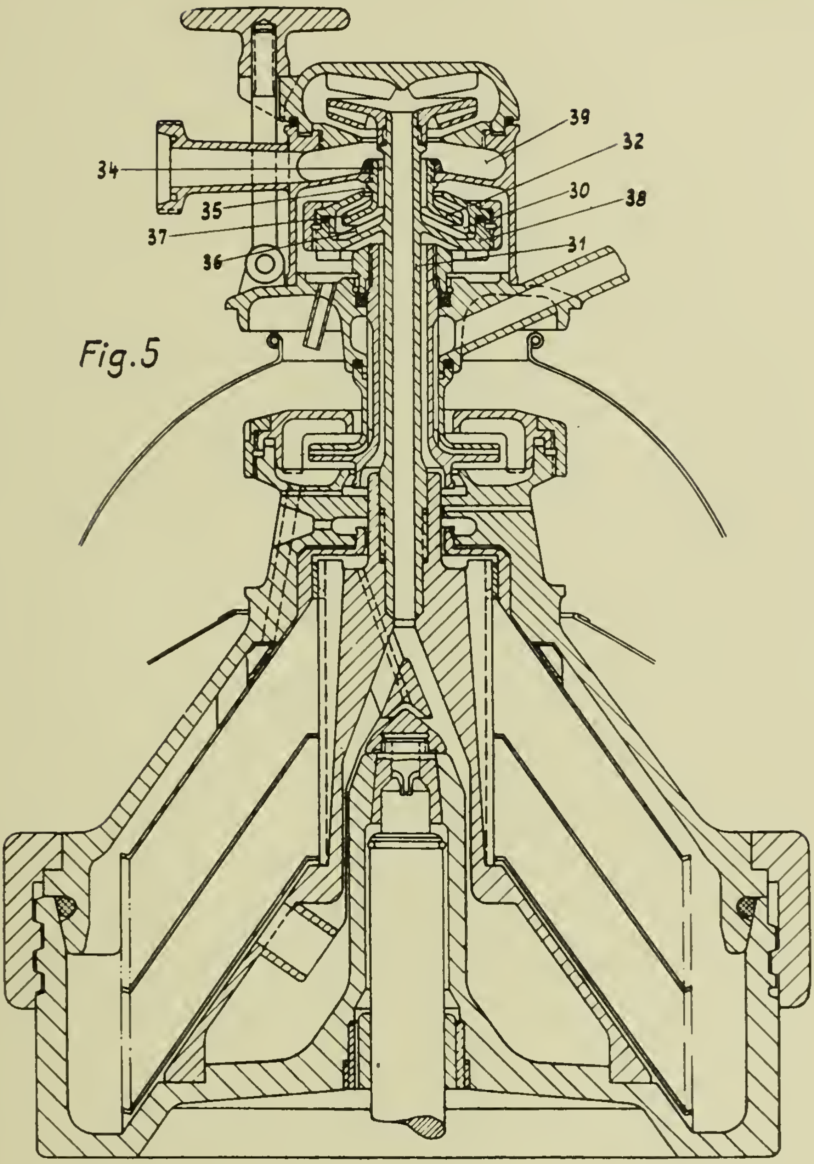


Fig. 5

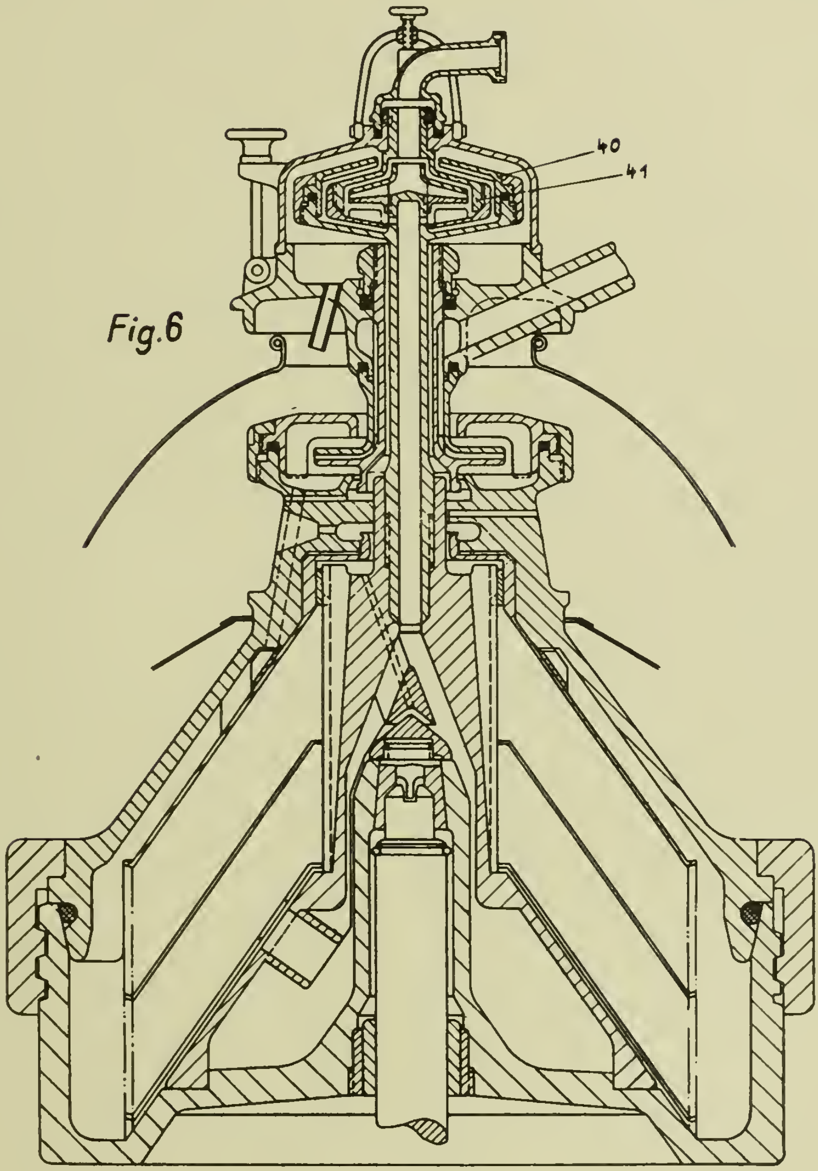
Inventor:
Wilhelm Wilsmann
By Lacey & Lacey
Attorneys

PUBLISHED
MAY 25, 1943.
BY A. P. C.

W. WILSMANN
SEPARATOR
Filed Dec. 27, 1940

Serial No.
372,013
5 Sheets-Sheet 5

Fig.6



Inventor:
Wilhelm Wilsmann
By Lacey & Lacey
Attorneys

Published May 25, 1943

Serial No. 372,886

ALIEN PROPERTY CUSTODIAN

LUMINESCENT MATERIAL

Willem Leendert Carolus van Zwet and Ferdinand A. Kröger, Eindhoven, Holland; vested in the Alien Property Custodian

No Drawing. Application filed January 2, 1941

Our invention relates in general to luminescent materials and to a method of preparing the same. More particularly, our invention relates to novel compositions of luminescent materials particularly useful in discharge devices, such as cathode ray tubes and gaseous electric discharge lamps, especially low-pressure mercury-vapor lamps. Still more particularly, our invention relates to novel compositions of luminescent materials of the zinc-beryllium silicate type.

One object of our invention is to provide a manganese - activated zinc - beryllium silicate phosphor of the most economical composition while luminescing with a definite color.

Another object of our invention is to provide a zinc-beryllium silicate phosphor the firing temperature of which is not critical above a certain temperature required to produce luminescence of a certain definite color.

Still another object of our invention is to render possible the preparation of a zinc-beryllium silicate phosphor which has a certain definite color of luminescence when fired at a certain temperature but which does not change in color when fired at higher temperatures, i. e., the color of the luminescence is not affected by firing to temperatures above a certain critical temperature at which luminescence of a certain definite color is established.

Further objects and advantages of our invention will appear from the following description of species thereof.

The use of luminescent mixtures containing zinc-beryllium silicates activated by means of manganese is well known. Thus, in British patent specification 492,296, it has been proposed to mix together the oxides of silicon, manganese, beryllium and zinc and to work them into luminescent material. The mixing proportions mentioned therein are highly divergent, and it is stated that it would be possible to vary the color of the luminescence of these mixtures from green-yellow to red by modification of the percentages of the four components. Limits between which this variation would have to take place are not mentioned. Commonly speaking, the best results would be obtained if the four materials silicon, manganese, zinc and beryllium be available in equal quantities.

Furthermore, it has also been suggested (United States patent No. 2,103,085 corresponding to British patent No. 480,356) to use fluorescent material in mercury-vapour discharge lamps, which material consists of a zinc-beryllium silicate activated by means of manganese. In this patent, the composition $ZnOBeOSiO_2$, including a small quantity of manganese, is stated to be a very advantageous ratio for this silicate.

In nearly all prior publications, such as those referred to above, only very general data is found for the ratio of the various oxides. Only once are definite ratios mentioned and in this last-mentioned case it is proposed to use a silicate containing the oxides of Zn, Be, Si and Mn in a stoichiometric ratio (British patent specification 492,296).

After extensive research we have now found what ratio must be chosen in order to obtain on the one hand a definite color and on the other hand the most economical composition of the fluorescent mixture. The result of this research is the method according to the present invention which consists in that, in preparing a luminescent mixture containing a zinc-beryllium-manganese silicate, the silicate is obtained by mixing together such quantities of zinc-, manganese-, beryllium- and silicon compounds that these materials are available in the mixture, exclusively or well-nigh exclusively as a homogeneous phase of the expression Me_2SiO_4 (i. e., the orthosilicates of zinc, beryllium and manganese) or thereabouts, zinc, beryllium and manganese being divided so that there are not more than 17 g. mol. of beryllium silicate and 25 g. mol. of manganese silicate (Mn_2SiO_4) to 100 g. mol. of zinc-silicate.

In the present case, the term "well-nigh exclusively" is to be understood to include also fluorescent mixtures which, for instance due to inaccuracy in the process of manufacture, contain a homogeneous phase of the expression Me_2SiO_4 and in addition impurities and other mixtures. The term "thereabouts," as applied to the expression Me_2SiO_4, is to be understood to mean that the homogeneous phase can naturally contain somewhat more or somewhat less of the components than would be the case according to the formula Me_2SiO_4, but that in this very special case these deviations are so small that the homogeneous phase can be indicated by the formula with an accuracy substantially corresponding to normal analysis errors.

Upon close examination of the well-known luminescent mixtures containing zinc-beryllium silicates, the unknown and surprising fact is found that, with these silicates, the active part, i. e., the part responsible for the luminescence and determining the color thereof, is a silicate of the composition Me_2SiO_4 which can be dis-

solved in acids. Whatsoever there is further available in the form of oxides or silicates does not affect the color of the luminescence at all, but instead only decreases the latter. Moreover, these admixtures may have a detrimental effect in another way. We have found, for instance, that in a mercury-vapor discharge tube, whose wall is coated with a layer of silicic acid, the luminous intensity decreases, after some time, to a much higher degree than in a similar tube into which no silicic acid has been introduced. The color of the luminescence is determined by the ratio of zinc, beryllium and manganese according to the above formula; in this case the maximum ratio may be so chosen that, apart from impurities, the mixture contains 17 g. mol. of beryllium silicate and about 25 g. mol. of manganese silicate to 100 g. mol. of zinc silicate, since at the practicable reaction temperature, the presence of excessive quantities of beryllium silicate gives rise to the production of mixtures with more than one phase. These additional phases are not luminescent; at least they do not exhibit the technically desired luminescence. Further undesired phases occur if the sum of the basic oxides is larger than, according to the formula, can combine with the silicic acid, or if there is more silicic acid than there can combine with basic oxides. In the nature of things, the maximum quantity of beryllium silicate which can be available in the homogeneous phase depends to a certain extent on the ratio of zinc silicate to manganese silicate and on the temperature at which the preparation takes place. The same applies to the quantity of manganese silicate, but the solubility of this silicate in beryllium-zinc silicate lies appreciably higher than the quantities mentioned in the present case; but then a region is entered which is not important for the practical use as a luminescent material.

According to one example of the method according to the present invention, the ratio of the constituents is so chosen that the silicate of the formula Me_2SiO_4 does not contain more than 17 g. mol. and not less than 5 g. mol. of beryllium silicate and not more than 20 and not less than 0.1 g. mol. of manganese silicate (Mn_2SiO_4) to 100 g. mol. of zinc silicate. An important advantage of the method according to the invention is that the heating of the reaction mixture, if it be desired to obtain a luminescent material exhibiting a definite color, can be effected less carefully than according to the existing methods. In fact, as has been outlined above, the color of the luminescence is determined by a ratio of the elements in the silicate of the said formula. From this it results that, if the reaction mixture has been so chosen that at a temperature *t* all of the available manganese silicate and beryllium silicate can be dissolved in the zinc-silicate, then a heating of the reaction mixture above this temperature does not involve a variation of the color of luminescence, it being assumed that in the preparations in question the phase-equilibrium obtained is established by quenching.

As is well known, it is not easy with all reactions between solid materials to achieve reproducible results on account of the low speed of diffusion of the reaction components. This difficulty occurs to a high degree in preparing luminescent silicates, and the above possibility to heat to a higher temperature without change in the color of the luminescence of the resulting product can be utilized to advantage for reducing these objections.

The method according to the present invention may be carried out, for instance, in the following manner:

The oxides of zinc, beryllium, manganese and silicon, in the pure state as necessary for luminescent material, are mixed together in a ratio of 100 g. mol., 11 g. mol., 3 g. mol. and 57 g. mol. respectively. The resulting admixture is then ground with alcohol for a relatively long period of time, say 24 to 48 hours, in a ball mill, subsequently dried and heat-treated or fired for some hours at a temperature of 1200° C. or higher, and then quenched. The product obtained luminesces yellow at ambient temperature.

Another method of preparing the zinc-beryllium silicate material according to the invention is as follows:

To a solution of zinc oxide in ammonia and ammonium carbonate containing 8100 gms. of zinc oxide, there are added 3720 gms. of silicon dioxide in the form of hydrolized ethyl silicate, 1575 gms. of beryllium sulfate ($BeSO_4$) and 495 gms. of manganese as manganese nitrate in an aqueous solution. The whole is evaporated to dryness, heat-treated or fired for one hour at a temperature of at least 1300° and subsequently cooled rapidly, thus producing a very pure red luminescing zinc-beryllium-manganese silicate.

The mixtures thus obtained may advantageously be used for fluorescent screens of cathode ray tubes and for fluorescent layers of gas- or vapor-filled discharge lamps.

WILLEM LEENDERT CAROLUS VAN ZWET.
FERDINAND A. KRÖGER.

Published May 25, 1943 Serial No. 372,968

ALIEN PROPERTY CUSTODIAN

MAGNETIC TACHOMETERS

Charles Hilaire Henri Rodanet, Neuilly-sur-Seine, France; vested in the Alien Property Custodian

Application filed January 3, 1941

The invention relates to magnetic tachometers; it is adapted to improve them, to simplify their construction and to render the utilisation thereof more convenient for certain applications.

Magnetic tachometers are composed of an index driven by a pivoting metallic bell, restored by a spring towards a fixed position of rest, and movable in the air-gap of a magnetic circuit comprising a fixed framework and a rotating magnet. Up to now, the axes of rotation of the bell and of the magnet always geometrically coincide; according to the invention, they are, on the contrary, perpendicular to each other. This arrangement simplifies the construction and appreciably reduces the cost price; furthermore, it renders the assemblage of the tachometer very easy when the latter is used as speedometer on bicycles and motor bicycles. It is moreover mainly in view of this application that the apparatus has been devised; and in this case it is advantageous that the index, in its position of rest, should be at right angles to the plane formed by the axes of rotation of the bell and of the magnet. In fact, the axis of rotation of the magnet is laterally extended to receive a pulley, placed parallel to the bicycle wheel which transmits its movement thereto by means of a belt; the index, arranged as just stated, is therefore placed in a good reading position.

The apparatus improved according to the invention can, of course, be combined with one or more mileage totalisers. In this case, the perpendicular arrangement of the axes of rotation of the bell and of the magnet allows of obtaining another advantage, since the axis of the totaliser drums, necessarily parallel to the dial or reading plane, is then parallel to the axis of rotation of the magnet, instead of being at right angles thereto as in known apparatus.

A right angle transmission is therefore unnecessary, and a much more simple and more economical arrangement results therefrom.

In the accompanying drawing, illustrated by way of example only:

Fig. 1 is a partial perspective view with parts broken away and more particularly showing the characteristic arrangement according to the invention.

Fig. 2 is a general elevation of a tachometer.

Fig. 3 is a plan view corresponding to the preceding figure.

Fig. 4 is a view corresponding to Fig. 3, but on a larger scale, the cover of the case and the dial being removed to show the entire mechanism.

Fig. 5 is a section made according to line V—V of Fig. 4.

The magnetic tachometer, illustrated in Fig. 1, comprises an index 1 rendered angularly rigid with a spindle 2, rigid with a driving rotating bell 3. The spindle 2 is journalled, near its upper part, in a bearing 4 and, at its lower end, in a bearing 5 forming thrust-bearing. The bearing 4 is rigidly connected to the case 6 of the tachometer and the thrust-bearing 5 is mounted in the bottom of said case.

The pivoting unit constituted by the index 1, the spindle 2 and the bell 3, is restored by a spiral spring 7 towards a fixed position of rest which is the zero position marked on a dial 10 bearing the indications of the instantaneous speed and over which the index 1 moves.

In contradistinction to the arrangement previously adopted in known magnetic tachometers, the spindle 8 of the rotating magnet 9 is perpendicular to the spindle 2 of the bell 3. This construction according to the invention has many advantages particularly when such a tachometer is used as speedometer on an ordinary bicycle, or on a motor bicycle. In fact, the spindle 8 on which the magnet rotates is laterally extended outside the case 6 to receive a pulley 11 (Fig. 2 and following), placed parallel to the bicycle wheel which transmits its movement thereto by means of a belt, the index 1 being, moreover, correctly placed in good reading position. Furthermore, this perpendicular arrangement of both axes allows of simplifying the construction and the assemblage, and of reducing the cost price, which is particularly advantageous for small tachometers adapted to be used on light vehicles as previously indicated.

As more particularly shown in Figs. 2 and 3, and in greater detail in Figs. 4 and 5, the improved apparatus according to the invention is combined with a mileage totaliser. On the spindle 8 of the pulley 11 is rigidly secured a pinion 12 meshing with another pinion 14 on which is journalled, about a spindle 15, slightly out of center relatively to the axis of rotation of pinion 14, a feeding or driving pawl 16. Said pawl 16 acts on a ratchet wheel 17 constituting the rotating input member of the mileage totaliser 18. A stop pawl 19 is pivoted at 20 on a plate 21 also supporting the spindle of pinion 14. A spring 22 connected at its ends, on the one hand, to the pawl 19 and, on the other hand, to the driving pawl 16, constantly urges both pawls 16 and 19 against the ratchet wheel 17.

It will be noted that the axis of the drums of

the totaliser 18, necessarily parallel to the dial or reading plane 10, is arranged parallel to the axis of rotation 8 of the magnet, instead of being at right angles thereto as in known apparatus. It is therefore unnecessary to provide a right angle transmission which constitutes another simplification in the construction and a reduction of the cost price of the apparatus.

The lid or cover 23 of the case is resiliently held and locked in position by projections 24 provided on said case and which engage in corresponding ports 25 formed in the lateral wall of the cover 23. Said cover holds the protecting glass plate 25^a in position of assemblage by clamping a plastic or resiliently distortable ring 26 peripherally surrounding said glass plate. Said ring 26 moreover allows of obtaining a fluid-tight closure.

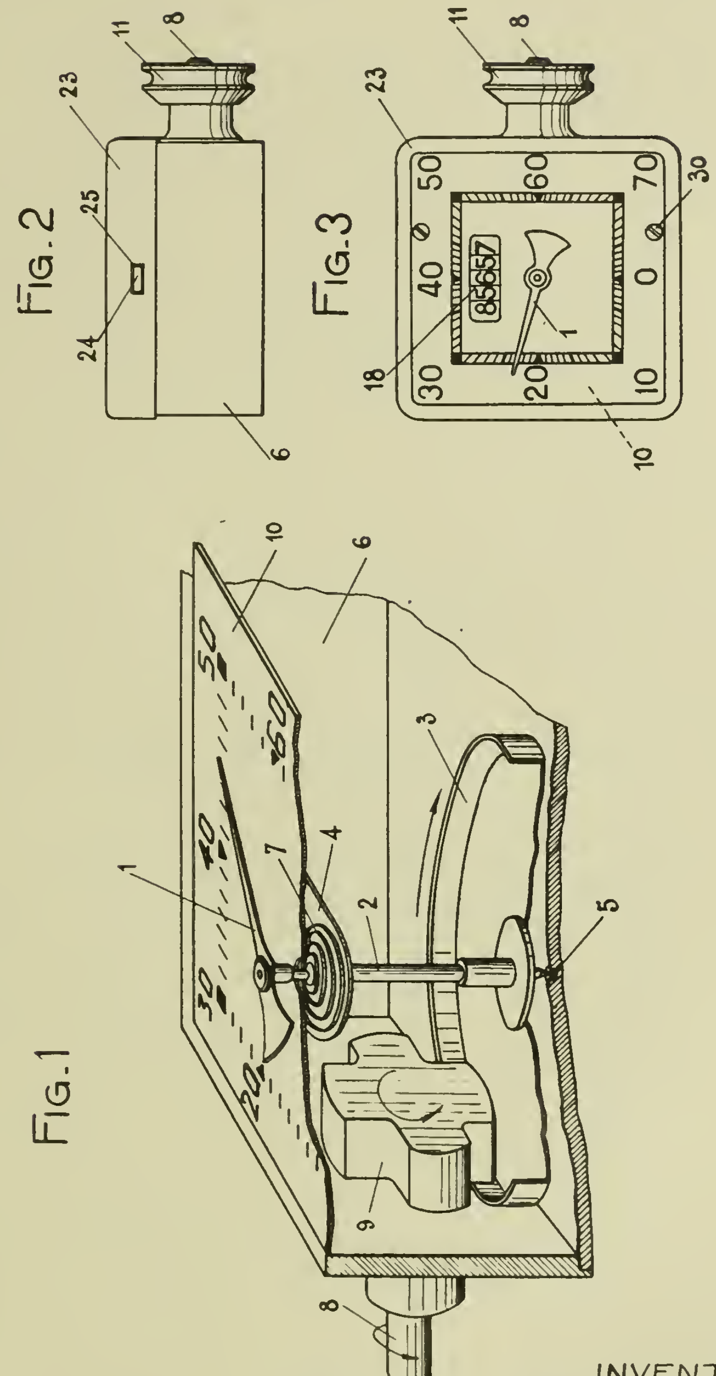
As more particularly shown in Figs. 4 and 5, the bearing 4 for the spindle 2 is provided in a small plate 27 secured by screws 29 on inner lugs or ears 28 of the case. The dial 10 is also secured on projections 29^a of the case by screws 30, and the bottom 6^a of the case is held in position by screws 31. On said bottom 6^a is secured, in particular by screwing, the bearing or thrust-bearing 5 for the lower end of the spindle 2.

A tachometer, devised as indicated, might be completed by a partial totaliser.

It is obvious that the embodiment previously described and illustrated is given herein only by way of indication and not in a limiting sense. All modifications or changes which do not alter in any way the main features above set forth or the desired result remain included in the scope of the present invention.

CHARLES HILAIRE HENRI RODANET.

PUBLISHED	C. H. H. RODANET	Serial No.
MAY 25, 1943.	MAGNETIC TACHOMETERS	372,968
BY A. P. C.	Filed Jan. 3, 1941	2 Sheets-Sheet 1



INVENTOR:
CHARLES HILAIRE HENRI RODANET
BY Haseltine, Lake & Co
ATTORNEYS

PUBLISHED

MAY 25, 1943.

BY A. P. C.

C. H. H. RODANET

MAGNETIC TACHOMETERS

Filed Jan. 3, 1941

Serial No.

372,968

2 Sheets-Sheet 2

FIG. 5

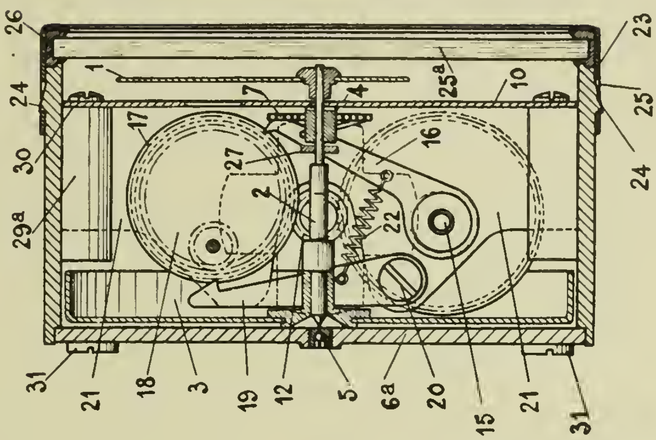
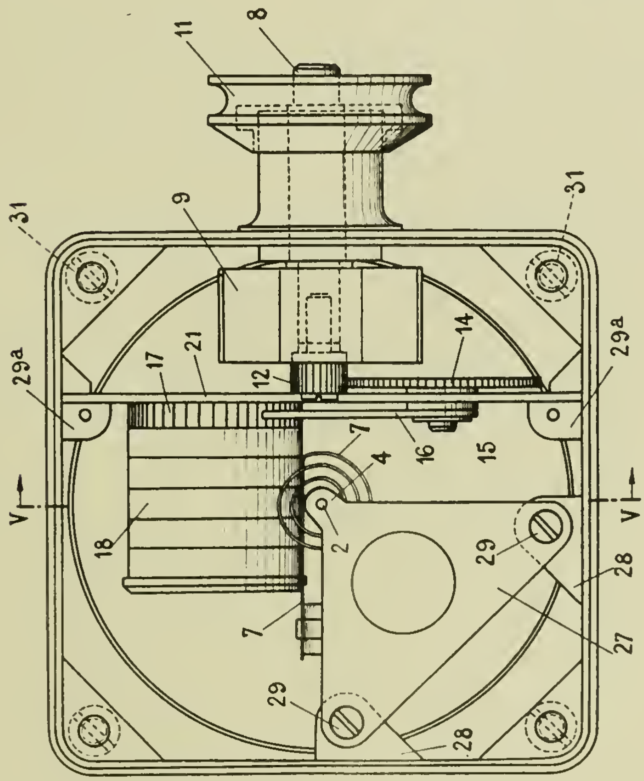


FIG. 4



INVENTOR
CHARLES HILAIRE HENRI RODANET
BY Haseltine, Lake & Co
ATTORNEYS

Published May 25, 1943

Serial No. 373,033

ALIEN PROPERTY CUSTODIAN

OPENING TINS AND OTHER CONTAINERS

Birger Johnsen, Sandnes Pr. Stavanger, Norway; vested in the Alien Property Custodian

Application filed January 3, 1941

The present invention relates to tins or other containers of the type in which the lid is attached to the container by seaming and where the seaming edge of the lid is provided with a roll up tab, which is seamed in together with the seaming edge and where the tin or container is adapted to be opened in that a comparative narrow strip of material along the edge of said lid is rolled up or ripped away by the aid of said tab, said material strip being preferably limited inwardly by a weakened line.

The object of the invention is to provide improvements in tins or containers of this type designed to render their opening more easy, certain and reliable than before.

According to this invention the material strip to be rolled up or ripped away during the opening operation is U shaped, including as well the outer part of the seaming edge of the lid as the inner, seamed in part of same, in order that the named material strip shall be double and thereby so strong that no danger arises that it shall break during the opening operation.

It has been formerly proposed to open tins with soldered lid or a lid not attached to the tin with a seam, by rolling up a narrow strip of material along the lid edge, but here the rolling strip is single, so that danger arises that the strip may break during the rolling operation. According to the arrangement after the invention this lack is removed. To open a seamed tin or container in this manner has never been proposed before, and the invention offer an improvement for the opening of such seamed tins or containers, which was hereto opened by rolling up the whole lid plate. The opening operation according to the invention is far more easy, certain and reliable and moreover the tin or container will be completely opened all around, no part of the lid remaining after the opening, which would obstruct the removal of contents from the container.

The arrangement according to the invention is shown by an example in the drawing, where

Fig. 1 show a box lid before it has been seamed to the container, Fig. 2 show a seamed container, seen from the side, partly in section and Fig. 3 the container seen from the side partly rolled open.

The lid **11** is attached to the container by a usual double seam and is provided with a slanting tab **14**, which is seamed in together with the seaming edge **12** of the lid. The container is adapted to be opened by rolling up or ripping away a narrow strip of material along the lid edge, and according to the invention this material strip is U shaped, including as well the outer part of said seaming edge **12** as the inner, seamed in part of same. This rolling strip is limited inwardly by a weakened line **13**, which by the tab **14** slant outwardly to one corner of the tab.

During the opening operation the seamed in part of the seaming edge **12** is forced to break out of the seam and the rolling up strip roll itself double on the opening key **15**, and thereby become so strong that any danger that the strip shall break is avoided.

BIRGER JOHNSEN.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

B. JOHNSEN
OPENING TINS AND OTHER CONTAINERS
Filed Jan. 3, 1941

Serial No.
373,033

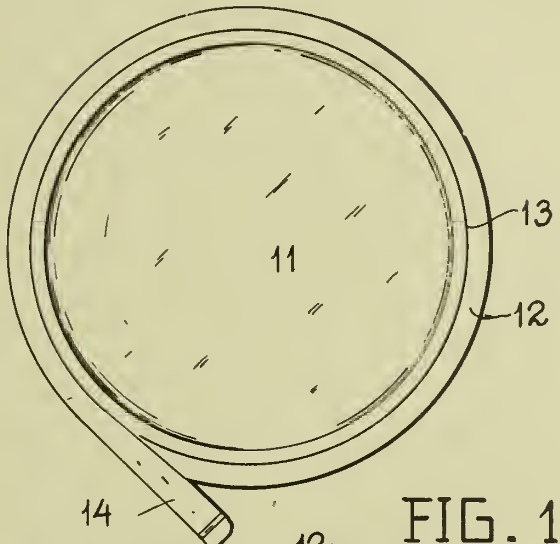


FIG. 1

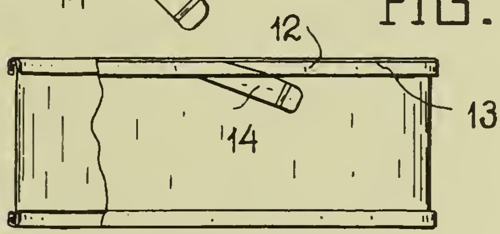


FIG. 2

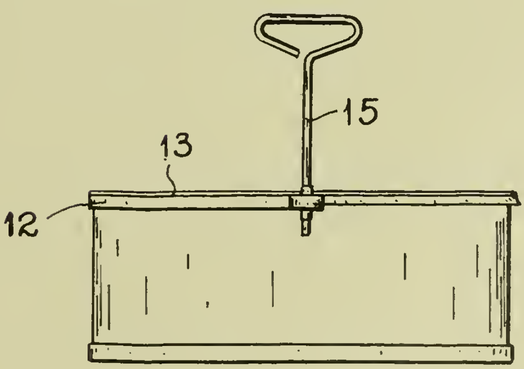


FIG. 3

Inventor:
Birger Johnsen
by his Attorneys
Howson & Howson

Published May 25, 1943

Serial No. 373,008

ALIEN PROPERTY CUSTODIAN

BLADE CARRYING ROTORS FOR AXIAL FLOW ROTARY MACHINES

Ulrich Meininghaus, Muelheim-Ruhr, Germany; vested in the Alien Property Custodian

Application filed January 3, 1941

The present invention relates to the construction of rotors carrying blades for axial flow rotary machines, and especially for steam and gas turbines.

It is the general object of the invention to provide an improved rotor for axial flow engines which is capable of running with a high number of revolutions per minute without showing any noticeable critical speed over the total actually used range of speed, and in particular a rotor which is easily to manufacture from parts kept in storage and formed to give a high resistance to centrifugal forces and which, therefore, is built up of a plurality of single discs with axially extending rims. Other, more specific objects of the invention will appear from the detailed description hereinafter.

The accompanying drawings illustrate by way of example different embodiments of the invention. Fig. 1 gives a vertical section through a steam turbine with a rotor according to the invention; Fig. 2 shows in an enlarged scale a section through a part of the rim of the rotor with a cylindrical ring inside of the rims of two adjacent discs; Fig. 3 the same section with a conical ring inside of the rims of two adjacent discs; Figs. 4 and 5 with a conical ring between the rims of two adjacent discs; Fig. 6 illustrates a rotor wherein the rims of adjacent discs are welded together and Figs. 7 and 8 give in detail the way of supporting the hubs of these discs on the shaft.

In Fig. 1 the steam enters the turbine housing 1 at 2, impinges the Curtis-blading 3 and flows then through the reaction blading 4 leaving the housing at 5. On the shaft 6 which is supported in the bearings 7 the discs 8—15 are shrunk. At the same time the rim of the disc 9 is rigidly supported in radial direction against the rim of the disc 8, the rim of the disc 10 against the rim of the disc 9 and so on. This support of the rims against each other in radial direction prevents any radial displacement of the rims relative to each other and therewith any radial displacement of the adjacent hubs 16 and of the different sections of the shaft 6 on which the hubs 16 are shrunk. In this way the shaft 6 is stiffened in a way that rises the critical speed of the shaft considerably. In fact the rotor construction as shown provides for higher critical speeds than heretofore known constructions. Compared with a rotor wrought of one piece of steel the total weight as one factor determining the critical speed is considerably reduced the shaft ends being just as rigidly connected to the whole assembly. Compared with a rotor welded together of single discs without centre bore the total weight is the same, but the shaft ends are more rigidly connected to the whole assembly than the two stub ends which are in direct connection with the end discs only.

The stiffness of the rotor will be further increased when the rims of adjacent wheels are additionally supported against each other in axial direction. For instance the rims of adjacent discs may be welded together as shown in Fig. 6. This may be done if the temporary difference in expansion between the rims and the shaft is taken up by axial gliding of the support between the hubs and the shaft. But dampening any relative lateral movement of the rims of adjacent discs will be sufficient in general. The construction of Fig. 2 provides a support of the rims of adjacent discs in radial direction which allows for gliding in axial direction so that any differential expansion of the rims as compared with the expansion of the shaft may be taken up by the rim support. This axially gliding support of the rims is effected by a ring 17 arranged inside of the rims 13 and 14 and pressed with its cylindrical outer circumference against the inner cylindrical surfaces of the rims 13 and 14 thus allowing to provide a rigid connection between the hubs and the shaft. The radial pressure exerted by the ring 17 is determined to the main part by the centrifugal force acting on the ring according to the chosen relation of the radial thickness of the ring wall to the mean ring radius. Additionally the ring may be pressed or shrunk into the rims without increasing the radial pressure considerably on account of the high elasticity of such thin walled rings. The radial pressure may, therefore, be determined practically independent of small deviations in the fit. This is a great advantage compared with the rotor construction shown in Fig. 1. The friction damping lateral movements of the rims will be comparatively small, constant and equally distributed on the circumference thus practically eliminating additional bending forces on the shaft in case of differential expansion of the rims. According to this part of the invention a comparatively small friction will suffice to prevent temporarily relative lateral movements of adjacent rims and thus allow for safely going through a critical speed. Thus the first critical speed may be chosen below the normal running speed of the rotor and will notwithstanding not effect the starting and stopping of the turbine.

In this way the advantages of actually running above the first critical speed are made use of at the same time eliminating the disadvantages.

In the construction of Fig. 3 the outer circumference of the rings 17 is provided with conical surfaces which press against corresponding conical surfaces of the rims 13 and 14. This construction facilitates the mounting of the rings 17 if these rings are inserted with some initial radial pressure to insure a tight fit in all conditions. At the same time it allows to increase the resistance against gliding of the rings 17 against the rims 13 and 14 and thus to prevent any gliding which may be caused continuously during each revolution by the slight bending of horizontal shaft due to the weight imposed on it. The friction should be such that gliding of the ring 17 against the rims 13 and 14 should occur only if a differential expansion between the rims and the shaft has to be equalized.

If the slant of the conical surfaces of ring 17 is increased as shown in Fig. 4 the rings 17 will be positioned between the rims of the adjacent discs. To secure an absolute centric position of the ring 17 it is held in position by an elastic wall 18 and an elastic ring 19 which is fastened to one of the discs by means of a caulking wire 20. The one end of the ring 17 may even press against the rim 14 with a radial surface if only the other end presses against the rim 13 with an inclined surface according to Fig. 5. The ring 17 must only have a smaller axial thickness at the outer circumference than at the inner circumference. Means for securing the relative centric position of ring 17 and the rim 14 are then indispensable but simpler. One elastic ring 21 is sufficient. With the increased slant the ring 17 is now positioned between the rims 13 and 14. The slant surfaces and the elastic connection between ring and rim will still support the rims against each other in radial direction, but at the same time in axial direction. At the same time the ring 17 will allow for relative axial movements caused by differential expansion of the rims and the shaft. If the rims expand in axial direction they expand also in diameter. The slant of the ring surfaces may be chosen in such a way, that axial and radial expansion balance out. To secure a nearly equal heating of the ring 17 and the shaft 6 the ring 17 is shielded against the steam by means of projections 22 and 23 and recesses 24 and 25 cut into the rims to decrease the transfer of heat. But the rings 17 are easily compressed by small axial forces and will easily expand by centrifugal force if the total axial length of rims plus rings does not coincide with the length of the corresponding shaft section. Similar slanted rings are assembled to springs for railways as is well known. The rings 17 will during all movements keep the axial distance between the rims equal along the whole circumference thus enforcing absolute parallelity of the discs. Thus the rotor is free to expand axially but at the same time stiffened against any bending. In this way the critical speed is actually raised.

A perfect stiffness of the total rotor is attainable by welding together the adjacent rims as shown in Fig. 6. It is then necessary to provide for a support between the hubs of the discs and the shaft which allows for axial gliding and yet keeps the centre of the shaft in line with the centres of the wheel hubs under all conditions. A construction securing such alignment is illustrated in Figs. 7 and 8. A bush 26 is shrunk on the shaft 6 and meshes with teeth 27 with radial flanks into corresponding recesses 28 of the hub 16 while the teeth 29 of the hub 16 mesh in the same way with recesses 30 of the bush 26.

As shown in Figs. 9 and 10 it will be easier to ensure a tight fit between the teeth 27 and the gaps 28 as well as between the teeth 29 and the gaps 30 if the teeth 29 are split in the centre by slots 31. Wedges 32 and 33 may then be driven into these slots 31 to drive the halves of the teeth 29 apart and bring to a close fit with the side walls of the gaps 30. The process of manufacturing the teeth is simplified because the thickness of the teeth and the width of the slots may differ to some extent before the teeth are driven apart. Slots 34 will make the bending of one half of the teeth 29 easier. To ensure absolute rigid connection between the parts the half of the teeth 29 transferring the torque is left rigid against bending. As three surfaces will always come in touch with the corresponding surfaces of the gaps 30 it is my preferred construction to employ three rigid halves of teeth 29 only.

ULRICH MEININGHAUS.

PUBLISHED	**U. MEININGHAUS**	**Serial No.**
MAY 25, 1943.	BLADE CARRYING ROTORS FOR AXIAL FLOW ROTARY MACHINES	**373,008**
BY A. P. C.	Filed Jan. 3, 1941	3 Sheets-Sheet 1

Fig. 1

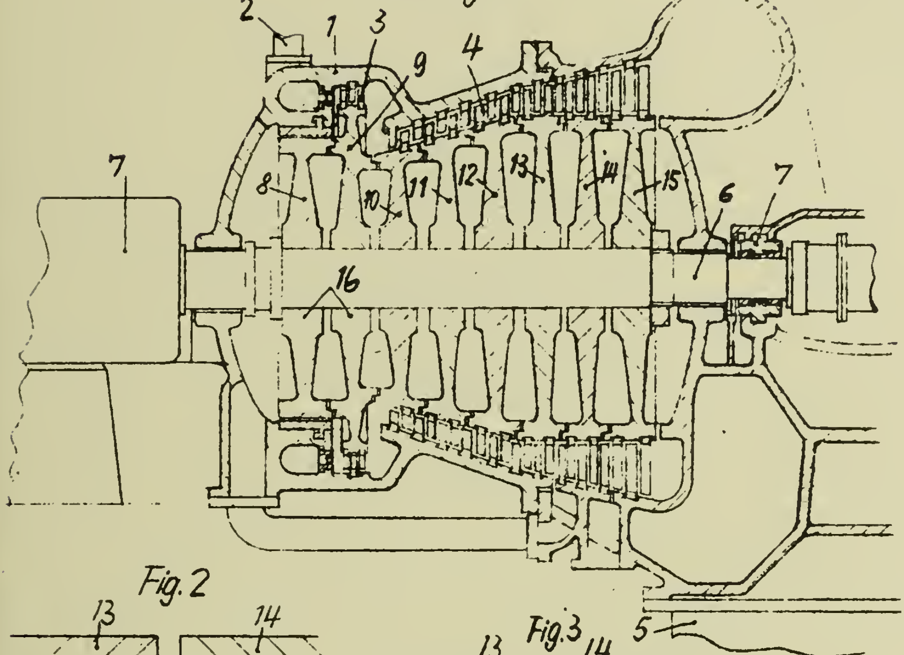


Fig. 2

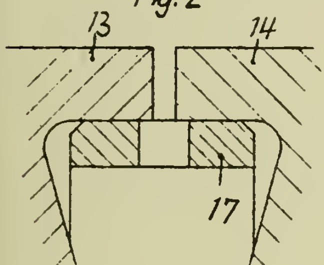
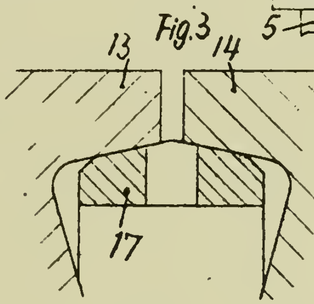


Fig. 3



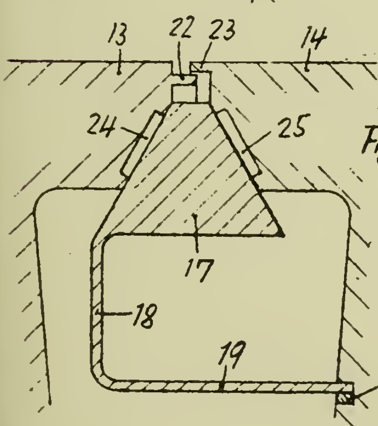
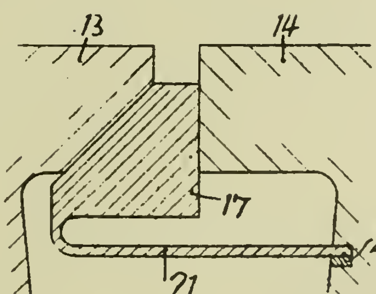


Fig. 4

Fig. 5



U. Meininghaus
INVENTOR
BY Jackenhack & Hirscher
ATTORNEYS

PUBLISHED
MAY 25, 1943.
BY A. P. C.

U. MEININGHAUS
BLADE CARRYING ROTORS FOR AXIAL FLOW ROTARY MACHINES
Filed Jan. 3, 1941

Serial No. 373,008

3 Sheets-Sheet 2

Fig. 6

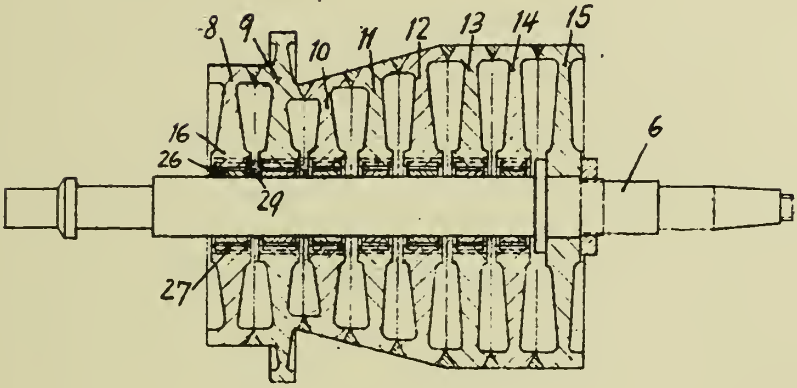


Fig. 7

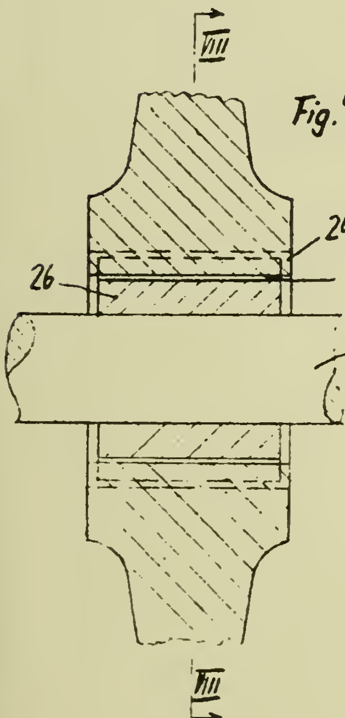
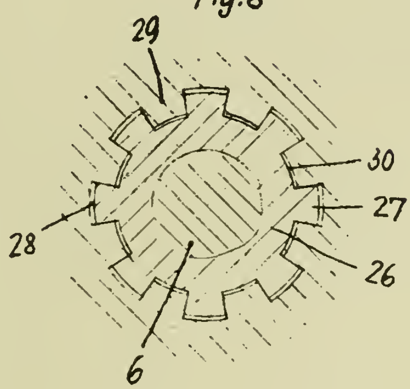


Fig. 8



U. Meininghaus
INVENTOR
BY [signature]
ATTORNEYS

PUBLISHED
MAY 25, 1943.
BY A. P. C.

U. MEININGHAUS
BLADE CARRYING ROTORS FOR AXIAL FLOW ROTARY MACHINES
Filed Jan. 3, 1941

Serial No. 373,008
3 Sheets-Sheet 3

Fig. 9

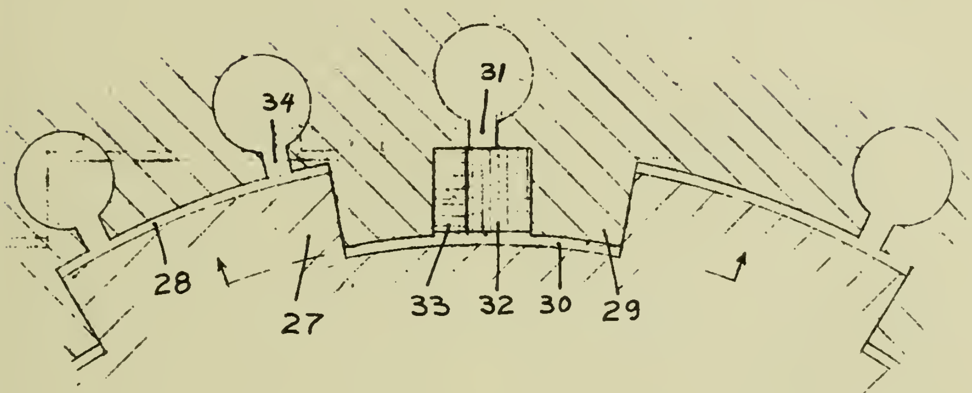
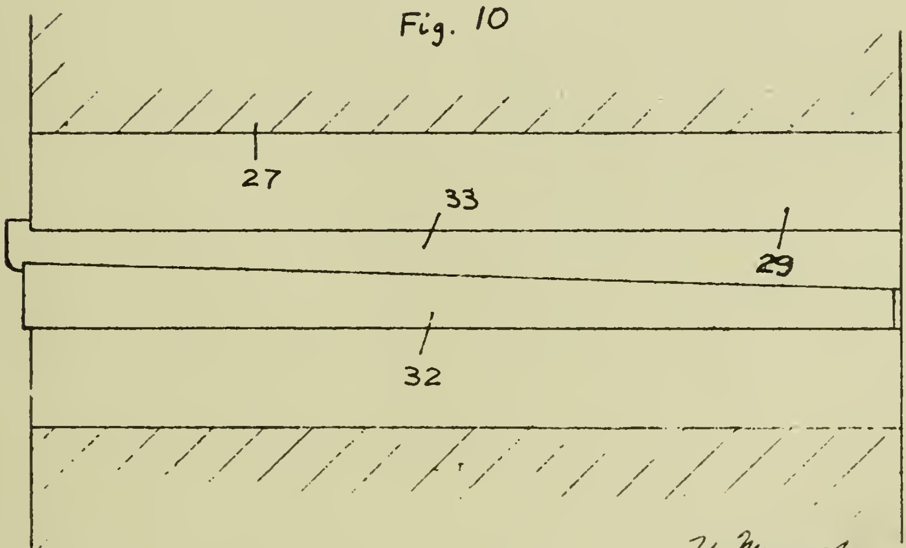


Fig. 10



U. Meininghaus
INVENTOR
BY
ATTORNEYS

Published May 25, 1943 Serial No. 373,058

ALIEN PROPERTY CUSTODIAN

STEAM TURBINES

Ernst Gente, Berlin-Siemensstadt, Germany; vested in the Alien Property Custodian

Application filed January 3, 1941

This invention relates to the fixing of blade rings for centrifugal machines with radial admission of the working fluid, particularly for steam turbines.

The two main constructional parts of a steam turbine with radial admission of the working medium, i. e., blade ring and disc represent bodies having an entirely differing mass and surface so that these parts when heated, cooled or deformed by external mechanical forces, for instance, by the centrifugal force react in a different manner. For instance, the ring with its small mass and large surface when heated expands quicker than the disc. If a rigid connection would be used between the ring and the disc, such high stresses would result owing to the difference in expansion that the material cannot absorb the same without damaging its texture, so that a rigid connection between the ring and disc must be avoided and such constructions must be used as to permit a free and independent expansion of the ring and disc.

According to the German Patent Nr. 237,541 this connection is obtained by the fact that between the blade ring and the disc, thin-walled cylinders are inserted whose thickness is so chosen that, on the one hand, a transfer of heat between the blade rings and the disc is prevented to a considerable extent and that, on the other hand, the blade ring when being deformed is as far as possible free to expand. However, in this case such considerable bending stresses occur in the cylinder-shaped connecting piece with increasing enlargement that the material can no longer take up the stresses. To meet this requirement the cylinder-shaped ring must be slotted, so that its cross-section is weakened, whereby the tangential stresses are so to say split up. Besides other drawbacks the slotting of the ring may present the great disadvantage in that the structure is no longer steam-tight.

The other possibility of providing a joint between the blade ring and the disc as free as possible is the kidney-shaped intermediate ring employed by Ljungström and which has given satisfactory results in a large number of turbines. This intermediate ring is, however, capable of being improved, insofar as it presupposes a bead joint. Such joints not only cause a stressing of the material beyond its yield point but also easily bring about a non-circular cross-section of the ring. In this case either the faults caused by the out of balance must be put up with or a rather complicated balancing method must be employed in order to ensure a smooth running of the turbine. From the manufacturing and operating point of view, the joint according to the German Patent 237,541 would therefore be preferable, provided that it would be possible to eliminate the faults inherent in the joint. The problems resulting therefrom are solved according to the present invention.

If the conditions presented when fixing the blade ring according to the German Patent 237,541 are investigated, it will be found that the moments which occur in the connecting ring between the blade ring and disc as a result of the enlargement of the blade ring are very great at the point where the blade ring is fixed but then decrease relatively rapidly in the form of a hyperbole. The material is therefore highly stressed at the point where the blade ring is fixed, whereas the other part of the cross-section is only subjected to relatively small stresses. As already mentioned above the high stresses have been reduced by slotting the ring. The abovesaid drawbacks may be removed according to the invention by arranging that the entire cross-section be as far as possible uniformly stressed, for if the entire blade ring were so dimensioned as to take up the maximum stress and would be left not slotted, this would not remove the abovementioned drawback, since the ring would have to be so amply dimensioned that a rigid connection between the ring and disc would result which would not meet the desired requirements. The resiliency of the ring which enables the free expansion of the blade ring with respect to the disc must therefore be retained. This may be accomplished according to the invention if the cross-section of the intermediate ring connecting the blade ring with the disc is given a height which decreases towards the point where the ring is secured to the disc, the cross-section being preferably of the triangular form. As already mentioned above the moment curve is similar to that of a hyperbole. Accordingly also the contour line of the cross-section is adapted to the moment curve. It is then possible without slotting the intermediate ring to absorb all stresses without overstressing the material and to utilize at the same time the material of the intermediate ring in a most favorable manner, since its entire cross-section or a substantial portion thereof is uniformly stressed.

According to the invention it is possible to design such an intermediate ring in a manner as has hitherto been done in connection with other proposals. In the case of a revolving disc the centrifugal force acting thereon has its point of

application in the center of gravity of the blade ring. The centrifugal force tends to shift outwardly the center of gravity of the blade ring cross-section, i. e., the intermediate ring integral with the blade ring is enlarged to a certain extent in the form of a funnel. In the same direction in which acts the centrifugal force of the blade ring, acts also the centrifugal force resulting from the blades and which therefore causes the intermediate ring to enlarge to a further extent. Consequently, the blade ring has the tendency to assume an inclined position. In this manner difficulties may arise in maintaining the clearances between the blades, for it is assumed that the sealing clearance has a cylindrical but not a conical form. By applying additional weights to the blade ring or to the intermediate ring or to both, moments may be produced which more or less balance the moments resulting from the two centrifugal forces mentioned above. When selecting these balance weights, the fact must be still considered that the shearing force produced by the enlargement of the intermediate ring produces a moment which opposes the enlargement. Under circumstances it may be necessary to consider this moment when determining the balance weights.

As already mentioned above this form of the invention is based on the proposals which have been made in another connection, as is described in the German Patent 512,883. When fixing the blades according to the Ljungström with the aid of kidney-shaped intermediate rings as mentioned above, the blade centrifugal force whose point of application is in the center of gravity of the blade causes a twisting of the cross-section of the blade ring about its center of gravity, i. e., the blade with its support assumes than the form of an arc. To straighten the cross-section of the support ring it has been proposed in this publication to employ additional masses whose centrifugal forces produce moments in the ring which balance the moments produced in the rings by the centrifugal forces of the blades and acting in the opposite direction. However, this refers as mentioned above only to such blades which are secured between two ring groups hingedly connected to the turbine discs, whereas the present invention is based on the fact that the blade ring ends in a thin tubular portion which is secured to the disc.

An embodiment of the invention is shown in the accompanying drawing in diagrammatic form.

The blades 1 of a steam turbine with radial admission of the working fluid are firmly held in position by the support ring 2 which ends in a tubular portion 3. The latter is firmly secured to the disc 4 by means of a caulking joint 5 and is prevented from being displaced by a weld joint 6. The centrifugal force P_1 is applied to the center of gravity of the support ring 2 and causes an enlargement of the ring 3. The rim force P_2 produced by the blades acts in the same direction. As a result of the rigid connection between the support ring 2 and the tubular portion 3, shearing forces P_4 are produced in the latter which tend to retain the ring 2. In view of the very high stresses to which the intermediate ring 3 is subjected the tubular portion 3 is not given a cylindrical shape as has hitherto been proposed but its cross-section decreases as shown in the drawing from the ring to the disc. In order to prevent the blades 1 from assuming an inclined position, balance weights are provided which produce the balance forces P_3 and P_5. In this case the force P_3 balances the forces P_1 and P_2, whereas the force P_5 balances the force P_4. The representation of the balance weights is purely diagrammatic. It is not necessary that two balance weights be provided. The two weights may also be combined to a single mass. It is also not necessary to arrange the balance mass as shown in the drawing.

The above considerations on the revolving disc of a steam turbine with radial admission of the working fluid apply also to other centrifugal machines with radial admission of the working fluid in which similar conditions occur. The same considerations apply also to the stationary disc in which no stresses due to centrifugal forces but other stresses caused by the unilateral superatmospheric pressure may occur.

ERNST GENTE.

PUBLISHED

MAY 25, 1943

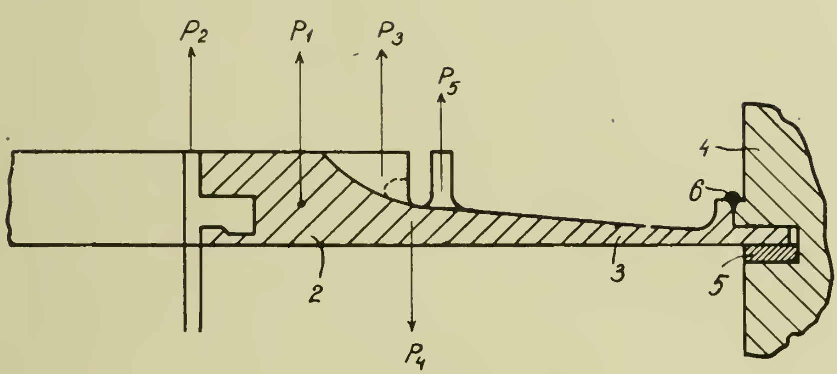
BY A. P. C.

E. GENTE

STEAM TURBINES

Filed Jan. 3, 1941

Serial No.
373,058



Inventor:
Ernst Gente
By Richardson and Amer
Atty's

Published May 25, 1943

Serial No. 373,239½

ALIEN PROPERTY CUSTODIAN

LIFTING JACK FOR MOTOR VEHICLES

Carl Schmitt, Leipzig C 1, Germany; vested in the Alien Property Custodian

Application filed January 6, 1941

This invention relates to a telescopic and fluid-operated lifting jack for motor vehicles.

According to the invention, the vehicle is provided at a suitable point, preferably under the hood at the dashboard, with a liquid-containing receptacle and a pump, or with a pump for producing compressed air, whence conduits extend to supply points suitably arranged on both sides of the vehicle in the center of the frame or running board and adapted to cooperate with the detachable telescopic lifting jack the filling of which with liquid or air is controlled from the driver's seat.

The invention is illustrated by way of example in the accompanying drawing showing an oil-operated hydraulic jack.

Figure 1 is a longitudinal section of a telescopic jack according to the invention in operating condition;

Fig. 2, a longitudinal section thereof in inoperative position,

Fig. 3, a sectional view of an oil receptacle with pump; and

Fig. 4, a side view of Fig. 3.

The lifting jack comprises telescopic tube members **1** correspondingly sealed relatively to one another and provided with passages **2** for liquid or air. The base member **3** is fitted with a ball and socket joint **4** so as to be universally movable and permit adaptation of the jack to unevennesses of the ground. With the aid of a screw member **5** the base **3** can be screwed into the lowermost tubular member to lengthen or shorten the jack as required. In the example shown holes are provided in the ball of the joint for moving the screw member by means of a pin, though other arrangements may be made of course. The top of the jack possesses a covering in which a conical sleeve **6** having a passage **7** for liquid or air is provided. By means of the sleeve **6** the jack, in fully telescoped condition as shown in Fig. 2, is attached to a conical member **8** of the supply outlet or mouthpiece comprising a valve cock **9** disposed in a casing **10** and held in inoperative position by a spring **11**, at which the sleeve **6** occupies a horizontal position. To the valve cock **9** a conduit **12** coming from the pump is connected, and the jack is attached to the sleeve **6** in horizontal position and then swung down 90° to occupy a vertical supporting position. The jack is then fixed between car and ground by the turning out of the base and engages with lateral flanges behind an angular member **13** on the frame **10**. The valve cock **9** is so constructed that it is opened when the jack is turned down, and closed during the return motion. The conical mouthpiece **8** and the sleeve **6** are, respectively, closed by a screw cap **15** and a threaded plug **14**. The supply mouthpiece **8** and its valve cock **9** are rotatably disposed in a U-shaped support **16** which is directly screwed to a vehicle.

A vessel **17** shown in Fig. 3 holds oil and contains also an in-built pump. At the free end of the pump piston a notch **19** receives a lever arm **20** mounted on a shaft butt **21** supporting a pump lever **22** which is swingable on the outside of the vessel **17** and, by means of a spring **24**, Fig. 4, can be actuated by the driver's foot through the medium of a connecting rod **23** projecting through a dashboard **25** into the interior of the vehicle. The vessel **17** is arranged on a bracket **26** secured to the dashboard **25**. A stop **27** in the vessel **17** limits the upward stroke of the piston **18**.

The pump cylinder is connected with the inside of the vessel **17** by a horizontal channel **28** in which two balls, **29**, **30**, act as valve, the lower larger ball **30** abutting against a spring **32** and the upper smaller ball **29** against a vertical bore **33** and a horizontal channel **34** which opens into an antechamber **35**. Above the vertical bore **33** a control piston **36** abuts against a spring **37** and possesses a locking means **38** permitting fixing of the piston in any desired position. A pin **39** of the control piston **36** engages the bore **33** and thereby the smaller ball **29**. Safety valves **40**, **41** are provided in the wall of the antechamber **35** as well as on the oil vessel **17**.

The mode of operation during pumping and use of the jack is as follows:

When the piston **18** draws, oil passes through the channel **28** and past the valve balls **29**, **30** into the pump cylinder, and when pressure is exerted by the piston **18**, the control piston **36** will also be forced down and, with its pin, push the valve ball **29** against the larger ball **30**, so that the supply channel **34** for the antechamber **35** is freed from the ball closure **29**, which now blocks the channel **28** leading to the vessel **17**, and oil can flow into the antechamber **35** whence it passes through the conduit **12** and the supply mouthpiece **8**, **9** into the telescope jack.

The jack can be rendered inoperative by the weight of the vehicle. For this purpose, the pump piston **18** and the control piston **36** are brought into central position by the connecting rod **23** and the piston **36** is held in position by the locking means **38**, whereby the channels **28** and **34** are released by the ball **29** and oil can flow back from the antechamber **35** through the channels **34**, **28** into the vessel **17**. Excess pressure in the antechamber **35** can be equalized by an excess pressure valve **40**, or oil may escape through this valve into the vessel **17**.

CARL SCHMITT.

PUBLISHED

MAY 25, 1943.

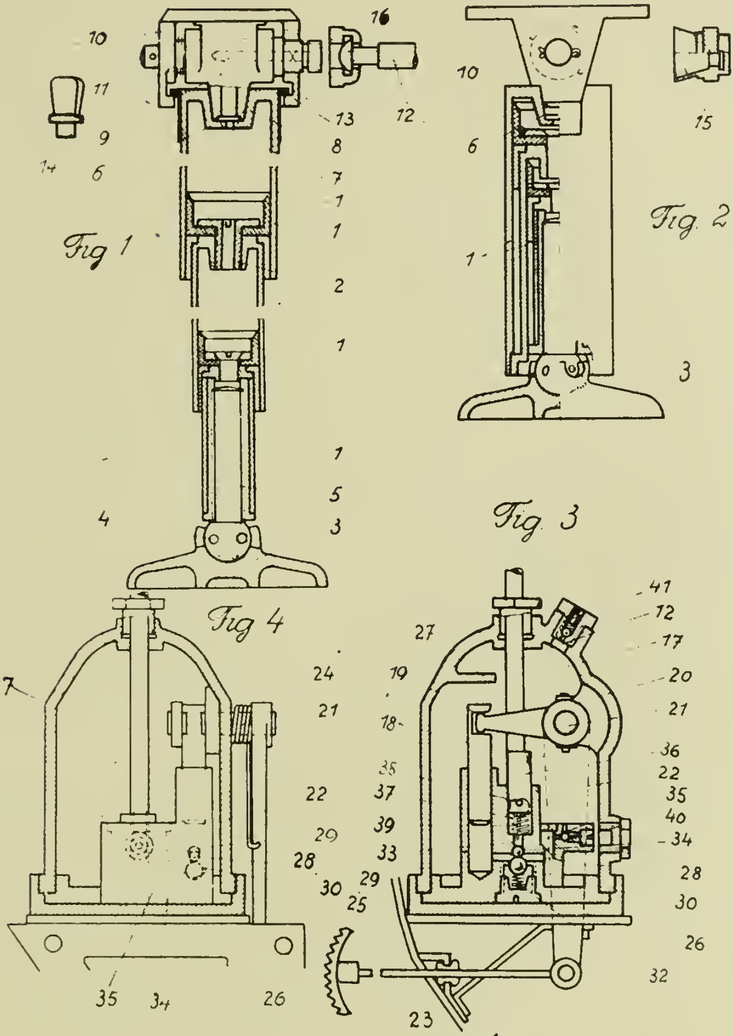
BY A. P. C.

C. SCHMITT

LIFTING JACK FOR MOTOR VEHICLES

Filed Jan. 6, 1941

Serial No. 373,239½



Inventor
Carl Schmitt

Published May 25, 1943 Serial No. 373,295

ALIEN PROPERTY CUSTODIAN

PUSHER RAMS FOR COKE OVENS

Heinrich Koppers, Essen, Germany; vested in the Alien Property Custodian

Application filed January 6, 1941

The present invention relates to devices for the removal of the coke cake from the coking chamber or retort of horizontal chamber- or retort-ovens for the production of gas and coke and more particularly to the pusher ram which is connected with means for effecting a reciprocating movement thereof.

It is common use to equip horizontal chamber ovens with a pusher ram for pushing the coke cake out of the oven chamber, said pusher ram comprising a head or shield which is supported by an essentially horizontal bar or rod. The dimensions of the pusher head are a little bit smaller than those of the oven chamber so that the pusher head may be easily moved to and fro in the chamber. If the carbonisation of the coal charge is finished the doors at both sides of the chamber are opened and the pusher ram is introduced into the chamber from one side. The coke cake formed is thereby pushed out at the other side of the chamber. That means that the pusher ram moves through the whole chamber to be emptied and is drawn back after the chamber is completely discharged.

During the pushing procedure the pusher rod is exposed to the high temperature of the coking chamber the walls of which mostly have a temperature exceeding 1000° C. If the pusher ram is drawn back after the discharge is completed, it cools down rather quickly. This frequent heating up and cooling down of the pusher ram has a detrimental effect on its metal body.

The main object of my invention therefore consists in providing such improvements in the said pusher arms as will protect the rod against the influence of the high temperature in the coking chamber and increase its stability to a considerable extent.

It is usual to design the pusher ram of coke ovens in the form of an I-beam the centre rod of which extends vertically. This design I too principally adopted for my invention.

For the reciprocating movement of the pusher ram one generally applies a spur rack fitted to the pusher rod. A pinion connected with a suitable drive gears into this spur rack. If the pinion turns in one direction the pushing ram is moved into the chamber while it is withdrawn from the chamber at the opposite movement of the pinion. I likewise keep to this driving mechanism for the pusher ram.

My invention now provides for to arrange said spur rack for the pinion at the one side of the vertical centre rod and to fit protection plates, preferably consisting of thick-walled cast iron plates to the other side of the rod. By this arrangement the susceptible centre rod of the pusher ram is protected against the disadvantageous heat radiation of the highly heated chamber walls in a very simple though effective manner.

Preferably I apply an I-beam, the centre rod of which has a smaller height than that of the flanks extending rectangularly to the rod.

With the above and other objects and features of my present invention in view I shall now describe a preferred embodiment thereof on the lines of the accompanying drawing in which

Fig. 1 shows a vertical section through the pusher ram with its driving mechanism and

Fig. 2 represents a front view of the pushing ram.

The pusher ram **1** consists of an I-wide-flanged sectional iron as for instance the German industrial standard 30. At such wide-flanged irons the horizontal flanks **2** have a thickness of **20** mm while the vertical rod **3** only has a thickness of **12** mm. On the one side of the vertical rod **3** a spur rack **4** is fixed. The other side of the vertical rod is fitted with protection plates **5** preferably consisting of cast iron.

The spur rack **4** gears into a pinion **6** which is horizontally seated in a supporting frame **7**. The latter is equipped with a connecting arm **8** which serves for the guidance of the shaft **9** above the pinion **6** and forms the supporting bearing **10**. Above the bearing **10** a pinion **11** is provided for which is connected to the driving means being coupled to a driving motor.

In order to take up the counterpressure of the driving pinion on the pusher rod a wheel **12** arranged in a supporting seat **13** is provided at that side of the rod **3** which is fitted with the protection plates **5**. The wheel **12** is guided by the guide bearing **14** by means of a shaft, the guide bearing **14** being connected at **15** with the bearing **10** of the connecting arm **8**. The connection **15** is preferably adjustable so that at a simultaneous adjustment of the supporting seat **13** which is designed accordingly, an adjustment of the wheel **12** may be arrived at in order to warrant that the wheel lies closely against the pusher rod even if some wear and tear occurred during the operation. The pusher ram **1** is guided within the pushing machine by means of carrying rolls **16** and upper guide rolls **17** in order to render a movement of the ram towards the top of the machine impossible.

Instead of the cast iron protection plates **5** and the counterpressure wheels **12** on the one side of the vertical rod **3** another spur rack which gears in a toothed wheel may be provided whereby the pressure of the driving pinion is taken up and a bending of the pusher rod in lateral direction is safely avoided.

I have now described in the above my present invention on the lines of a preferred embodiment thereof but in no way is my invention limited to the mode of carrying out as described and shown.

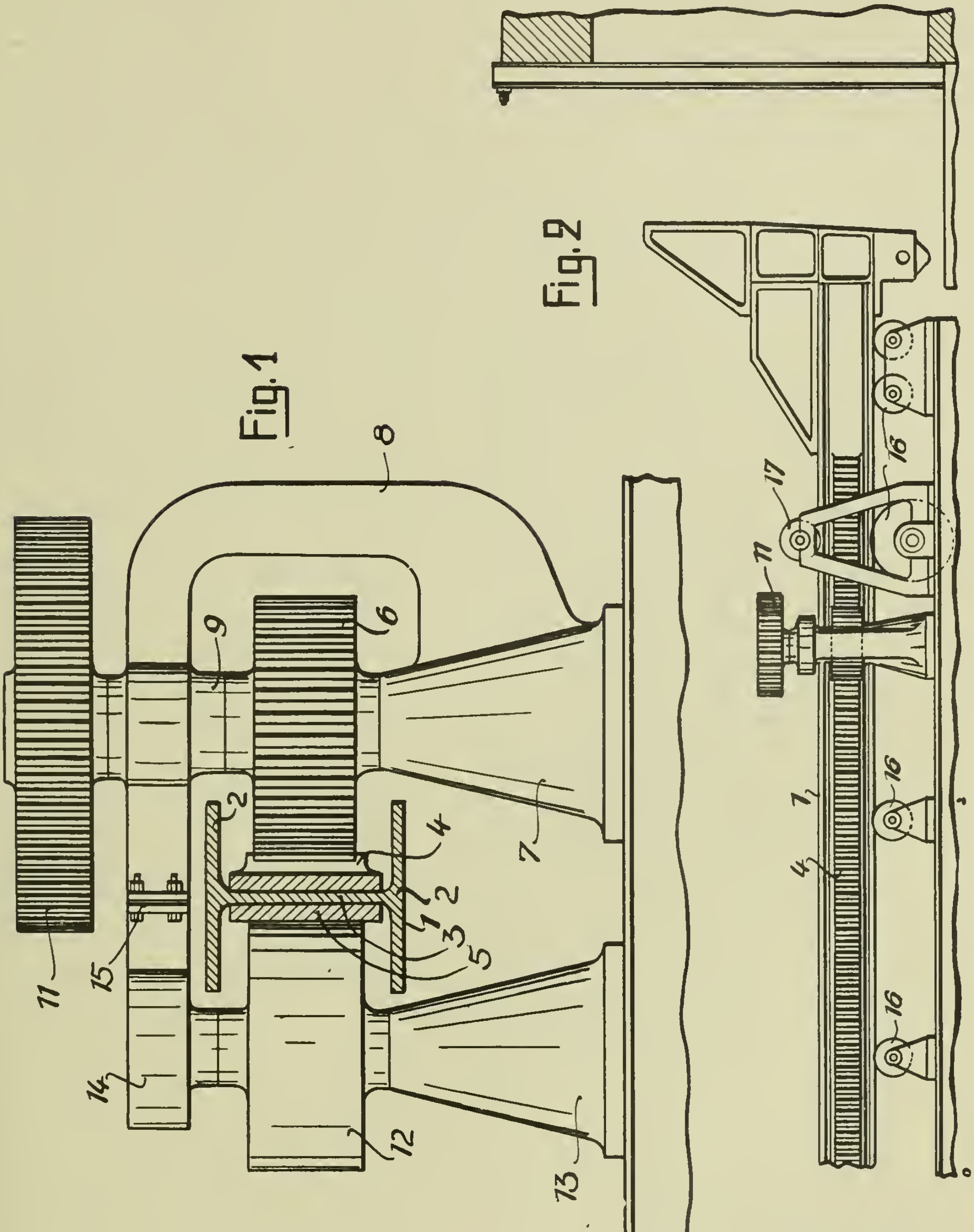
HEINRICH KOPPERS.

[illegible]

PUBLISHED
MAY 25, 1943.
BY A. P. C.

H. KOPPERS
PUSHER RAMS FOR COKE OVENS
Filed Jan. 6, 1941

Serial No.
373,295



INVENTOR
HEINRICH KOPPERS

BY Henry Love Clarke
ATTORNEY.

Published May 25, 1943 Serial No. 373,481

ALIEN PROPERTY CUSTODIAN

TURBINE FOR STEAM, WATER AND AIR

Alex Frederik George Glaser, Blimbing, Java, Netherlands East Indies; vested in the Alien Property Custodian

Application filed January 7, 1941

The invention relates to a method to start the rotor of a steamturbine revolving, by making use of steampassages instead of blades. Also for the invented device for the execution of the described method, the exclusive rights are applied for.

By the known types of steamturbines generally the steam is first let into guideblades (nozzles) at the one rotor-end to obtain the right direction and speed. The steamjets then go through the bladerim of the runner that is located behind the bladerim to leave that runner in nearly opposite direction. When the steam has still sufficient velocity or pressure, it can go through a second rim of guideblades (nozzles) to be led into the right direction, respectively to reassume its original velocity by its expansion, in which way this again can be led through the bladerim of a second runner that is located behind the bladerim, which runner is placed, like the first one, immovably on the same axle. In that way a great number of guideblades and runners can be placed behind each other if only the steam contains sufficient heatcontents. The pressure against the blades of the runners causes a great coupling that sets the axle revolving. The function of the guideblades (nozzles) is evident, the steam everytime escapes from the runners in the wrong direction, approximately opposite to their movement and the guideblades (nozzles) alter the wrong direction into the right one.

The disadvantages which are inherent to such types are the great losses of power caused by the friction of the steam between the guide- and running blades, the collisions against the sharp edges of the blades, the formation of whirlpools and whirls, then the socalled wheel-friction caused by the turning of the turbine-runners in the steam, while always the steam is flowing at the exterior round the runners, without executing any energy.

According to the invention these disadvantages are wholly eliminated, so that an important technical effect is obtained.

On the accompanying drawings a construction according to the invention is schematically shown, by way of example.

Fig. 1 shows a longitudinal section across the turbine according to the invention, by which the steam goes into two directions through the rotor, while

Fig. 2 shows a section A—B across Fig. 1.

Fig. 3 shows the steampressure and -velocity diagram and

Fig. 4 a longitudinal section across a turbine by which the rotor has been constructed in a slightly other way, while

Fig. 5 shows a longitudinal section across a turbine according to the invention by which the steam passes into one direction through the rotor.

Figs. 6, 7, and 8 show other constructions of the turbine.

Fig. 9 is the steampressure and steamvelocity diagram of the turbine of Fig. 8.

Fig. 10 shows a section C—D of Fig. 8.

Fig. 11 shows an outer circumference of the box with a broad groove.

Fig. 12 shows a construction of the turbine with more (three) jetpipes.

In Fig. 1 the frame is represented by **1** and the rotor by **2**, which consists of a cylinder or drum, shrunk round an axle **3**, that rests in bearers **4**, and two boxes **8** and **9**.

The right drum **2** of the rotor is deepened in the middle, which deepening is indicated by number **5**. From this point a groove **6** runs with left and right speed across each half of the drum, bordered by a small wire **7**. These grooves, which run to the ends of the drum, are gradually cut deeper as to meet all requirements. From each end of the drum the boxes **8** and **9** are pushed to at the circular deepening **5**. In this way the grooves become helicoidal steampassages which begin at **5** and through which the steam can escape at the ends. The inlet of the steam is, consequently, at **5**. The boxes **8** and **9** must be fixed in one way or another immovably round the drum **2**; the whole device (the rotor) must be able to rotate steam-tight in the turbineframe **1**. Through one or more jetpipes **10** (see Fig. 2) the steam flows with great speed into the deepening **5** and, steadily revolving, along the inner wall of the turbineframe, that is traced till the breath of deepening **5**, into the helicoidal passages, in which the resistance is increased by the refraction resulting in the release of energy, that sets the rotor revolving. In a straight pipe a gas or steam experiences resistance, which increases with the velocity. This resistance is strongly increased in curves. By the turbine according to the invention the passages are a series of circular curves placed behind each other. Instead of the helecoidal grooves in drum **2**, these grooves could be cut in the boxes **8** and **9**, as shown in Figs. 6 and 7, or both drum **2** and boxes **8** and **9** could be provided with helicoidal grooves, as shown in Fig. 8. In the last case care should be taken that by the fitting the grooves of the drum

and those of the boxes are put exactly opposite each other, so that on each half of the drum one steampassage is formed. By the construction of steamturbines of a greater axial line a greater number of adjoining steampassages, all with a similar bearing, can be fitted instead of one steampassage on each half of the drum. In this connection for greater units also more rotors of great axial line could be mounted on one axle (see Fig. 8). By the construction of two rotors on one axle the escape of steam could take place at the ends and exactly in the centre of the turbineframe. The inlet is as with the first described, in the centre of each rotor. Without any objection the steam could be profitably used as well in a high-pressure and further in a low-pressure turbine.

The construction could be simplified, by application of the system, by making the one end of the drum thicker, which end should be able to move freely and steamtight in the turbine frame as shown by **14** (see Fig. 5). At the innerside of that thick part the drum is circular deepened and from that spot the helicoidal groove begins which, as is the case with the former, is gradually cut deeper till the end. Over the drum a box is pushed to at the circular deepening, which box is fitted immovably at the drum. Also this rotor, shaped in this way, should be allowed to revolve steamtight at the boxside in the turbineframe. The steam is then again let into the circular deepening by means of one or more jetpipes. The exhaust steam at the ends of the rotor must be mutually combined to neutralise eventual axial differences of pressure. All these combinations are, however, variants on the first-described systems and resort under the same principles.

The invented turbinesystem offers many advantages: firstly the steam can be led through converging jetpipes with a certain velocity and under a certain pressure into the deepening. By the correctly defined mutual relations between jetpipes, the deepening **5**, the length and the diverging positions of the steampassages, it is possible to make the steam produce energy in the steampassages by which the steam-velocity through gradual expansion to at the final pressure can be kept constant. See the diagram of the steampressure and the steamvelocity (see Fig. 3). In this figure the line of steampressure is shown by **11**, that of the velocity by **12**, while line **13** shows the path of the condensator-pressure. Experiments will have to show in which way the grooves in the rotor must be made to allow the greatest possible efficiency. With regard to the question of the steamtight revolving of the rotor in the turbine frame it may be observed that this can be effected without much difficulty in the case of small turbines by providing the boxes at the outer circumference with broad grooves, while by big rotors the wellknown socalled labyrinth-packing (see fig. 11 No **18**) would be suitable.

Especially through its simplicity such a turbine offers great advantages, thus keeping the production-costs as low as possible. Another advantage lies in the fact that by the construction according to the invention the steamjet is hardly subject to any alteration of the direction of the flow, as is the case with the known types of turbines.

Fig. 4 shows a similar construction as the other drawings, with only this difference that circumstances may arise which will necessitate the boxes **8** and **9** being bend cupshape (**17**) at the ends with concentric opening for the steamexhaust. This will result in the steamexhaust taking another direction. Dependant on the admissable friction the bending must be made greater or smaller. The working development can also take place by allowing the steam to expand in diverging jetpipes from the initial pressure to at the final pressure. Then the steam flows with the greatest possible velocity into the deepening **5** and further into the steampassages, in which emission of energy takes place till the velocity of the steam is sufficiently exhausted. When the boxes **8** and **9** are shrunk in the right way on the drum leakages in the steampassages are precluded. By making use of a greater number of jetpipes (see fig. 12) the deepening **5** can be made smaller, so that the frictional loss at the small innerwall of the turbineframe can be reduced to a minimum. When, moreover, each jetpipe could be opened or closed by a regulating needle the steam could be allowed to flow through only 1 or 2 jetpipes by low load of the turbine, while the remaining jetpipes are closed, so that the work could be proceeded with full steampressure which would be to the benefit of a greater efficiency, by low load.

When the steam has come in the steampassages in which it can gradually and without shocking release kinetic energy, the work that is accumulated in it can be, without any loss, transferred to the rotor, which cannot be achieved by any other of the known steamturbines, in which the efficiency is considerably reduced by the losses caused by steamfriction against the guide- and the moving blades which must be polished with great care. The causes of the several losses of power have been explained already in the beginning of the description. By the turbine that is described in this application it is just the friction of the steam in the steampassages which sets the rotor revolving. Through all these propitious conditions it is possible to build, within normal scope, highspeed and lowspeed steamturbines of a high efficiency. As a result of the limited number of subparts which can be easily produced, the rotor can be made very light and yet very strong and especially cheap. Where the weight of the rotor can be kept small the losses caused by the lower friction are consequently also very small. In case of defects at the bearers the rotor can never be damaged, by lack of blades: the rotor is indestructable.

The rotor forms a stabil and strong unit so that the critical number of revolutions can lie, even by high speed, above the working capacity. By the acceleration of the number of revolutions never a critical number of revolutions is exceeded while the axle does not experience great inflections.

In conclusion it may be stated that, when instead of steam, air or liquid is led with great velocity through the passages the rotor can also be set revolving.

The turbine needs not be restricted to the described and scetched constructions, but may be altered in many ways within the scope of the invention; of such alterations some examples have already been shown in the description.

ALEX FREDERIK GEORGE GLASER.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. F. G. GLASER
TURBINE FOR STEAM, WATER AND AIR
Filed Jan. 7, 1941

Serial No.
373,481
5 Sheets–Sheet 1

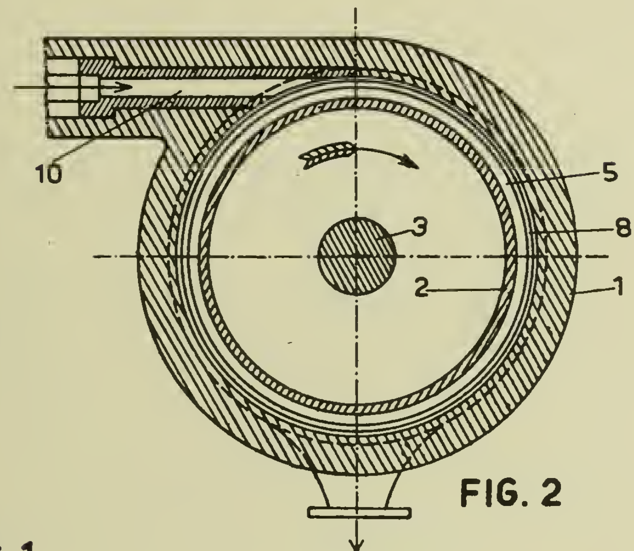


FIG. 2

FIG. 1

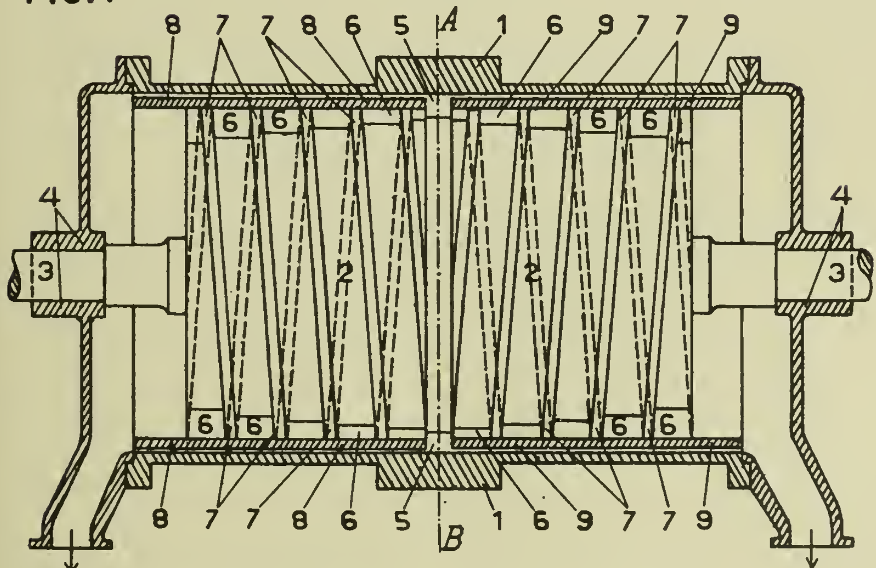
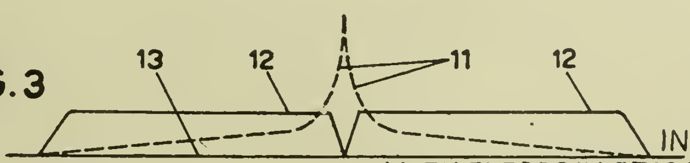


FIG. 3



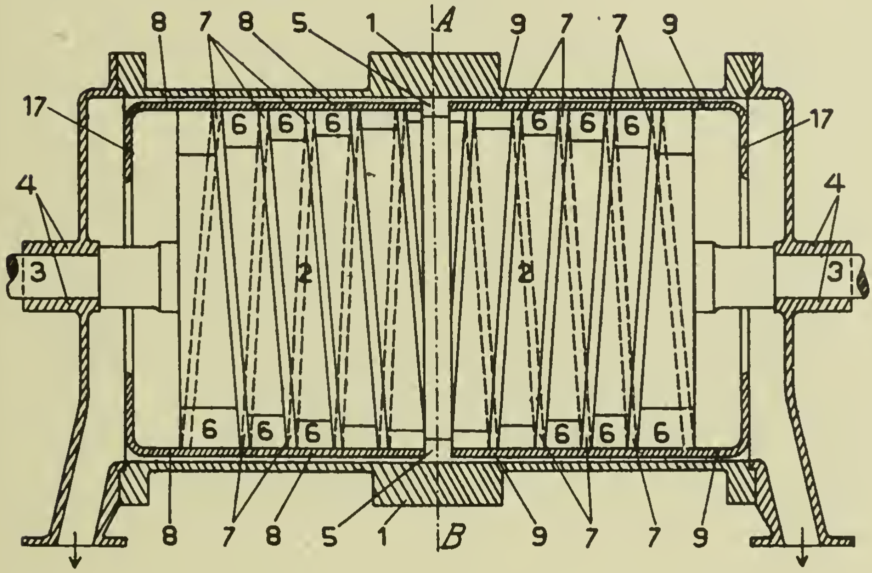
INVENTOR:
ALEX FREDERIK GEORGE GLASER
BY
Haseltine, Lake & Co. ATTORNEYS

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. F. G. GLASER
TURBINE FOR STEAM, WATER AND AIR
Filed Jan. 7, 1941

Serial No.
373,481
5 Sheets-Sheet 2

FIG. 4



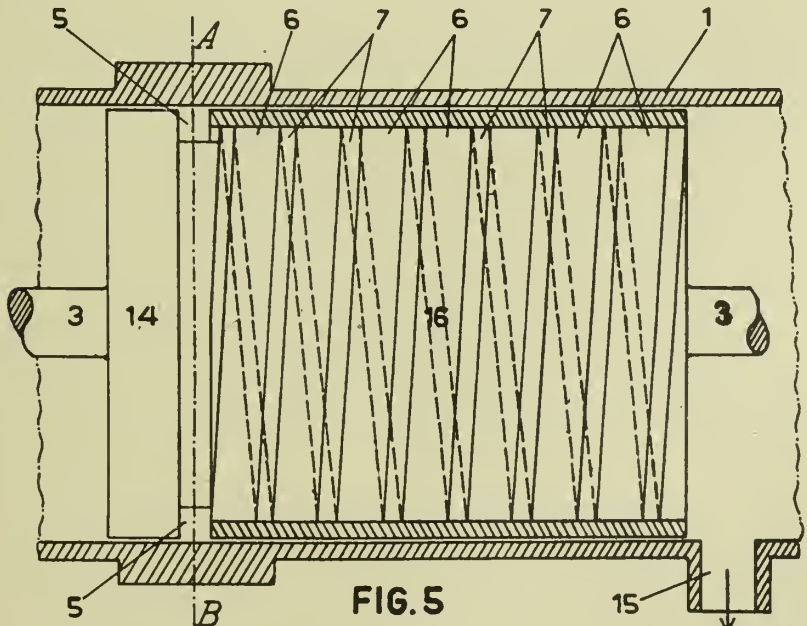
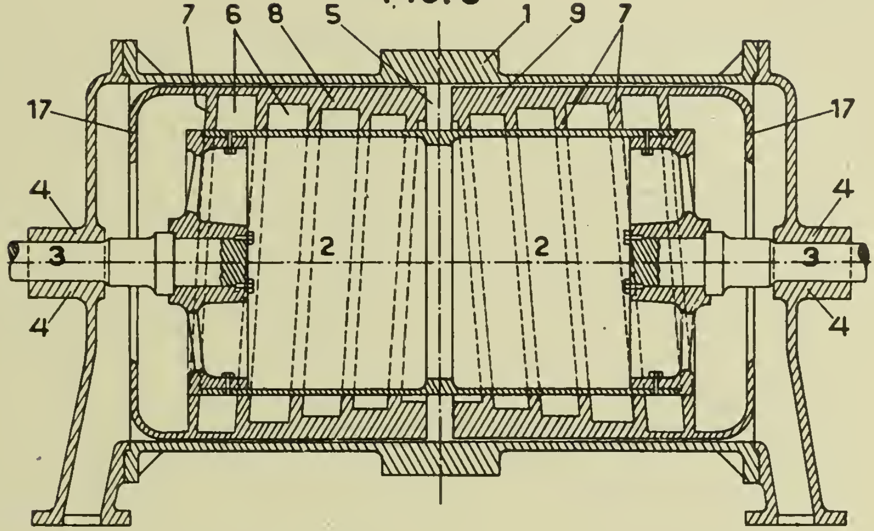


FIG. 5

INVENTOR:
ALEX FREDERIK GEORGE GLASER
BY Haseltine, Lake & Co.
ATTORNEYS

PUBLISHED	A. F. G. GLASER	Serial No.
MAY 25, 1943.	TURBINE FOR STEAM, WATER AND AIR	373,481
BY A. P. C.	Filed Jan. 7, 1941	5 Sheets-Sheet 3

FIG. 6



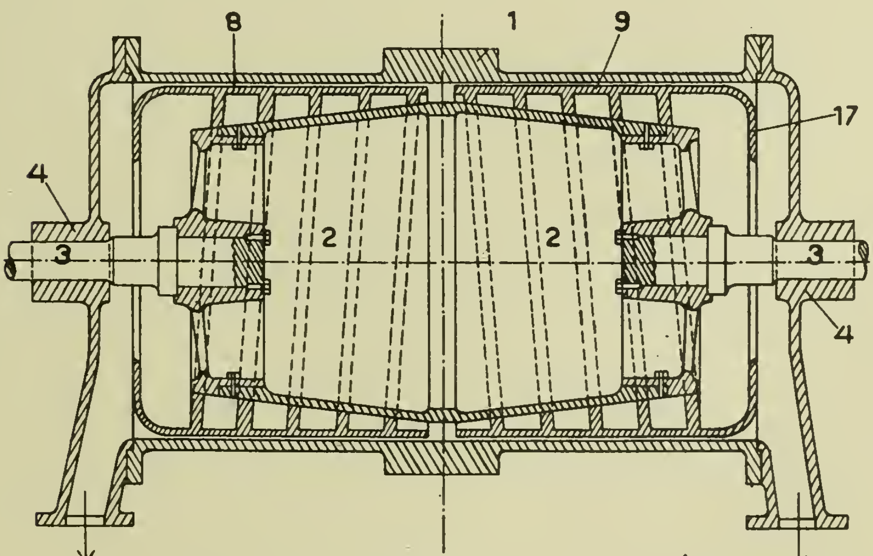


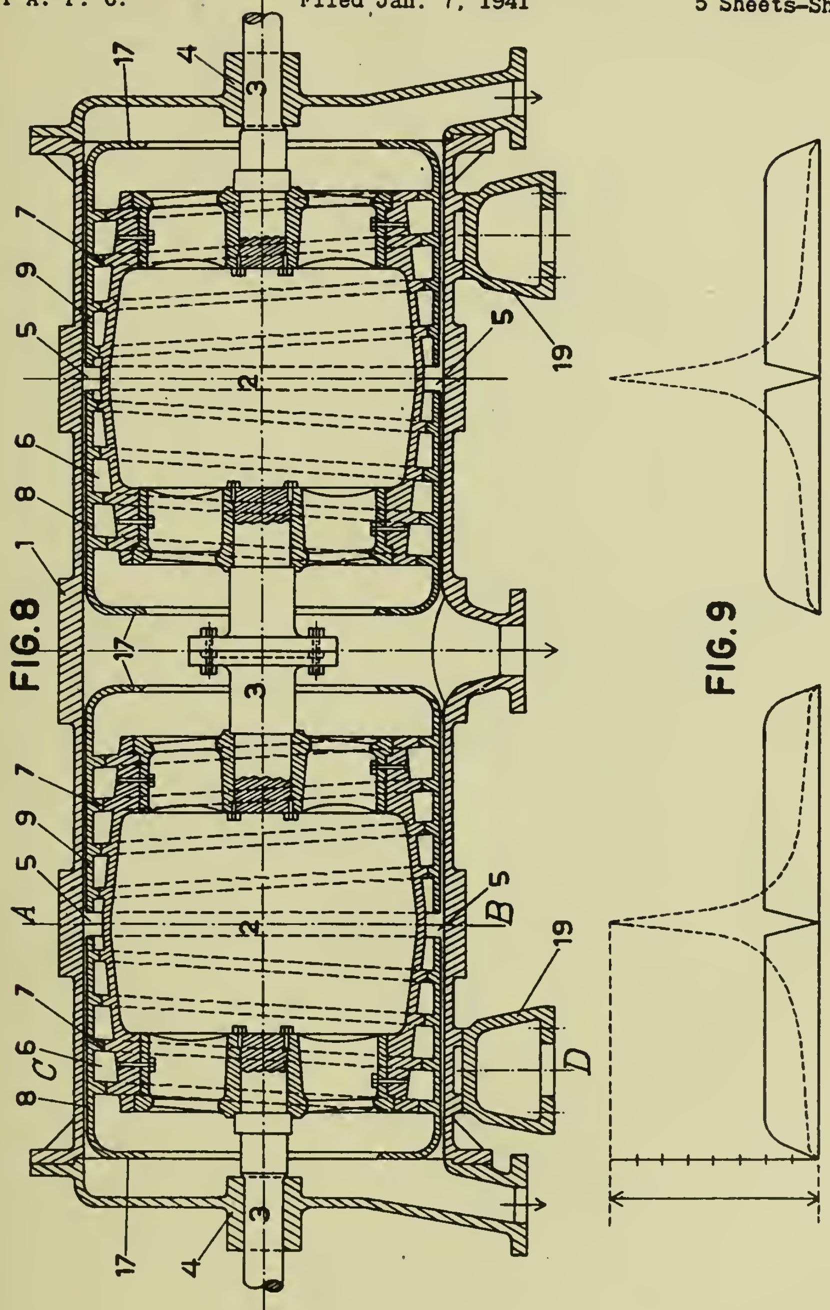
FIG. 7

INVENTOR:
ALEX FREDERIK GEORGE GLASER
BY Haseltine, Lake & Co.
ATTORNEYS

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. F. G. GLASER
TURBINE FOR STEAM, WATER AND AIR
Filed Jan. 7, 1941

Serial No.
373,481
5 Sheets-Sheet 4



INVENTOR:
ALEX FREDERIK GEORGE GLASER
BY Haseltine, Lake & Co.
ATTORNEYS

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. F. G. GLASER

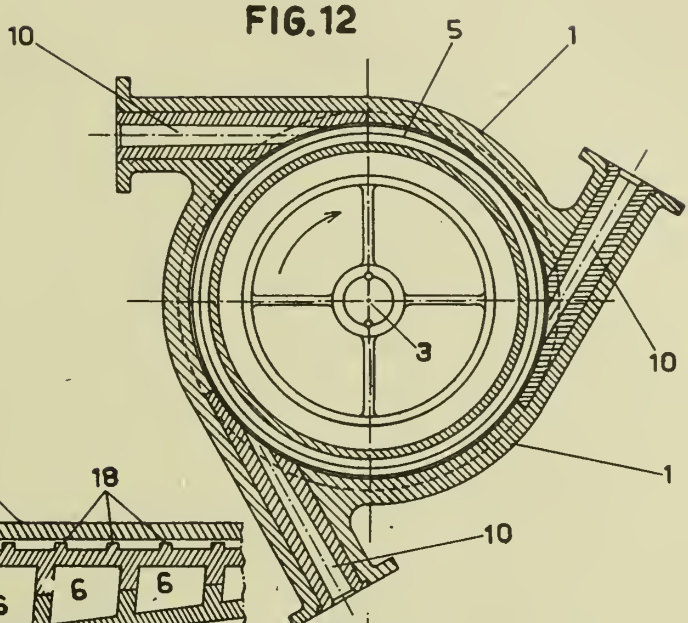
TURBINE FOR STEAM, WATER AND AIR

Filed Jan. 7, 1941

Serial No. 373,481

5 Sheets-Sheet 5

FIG. 12



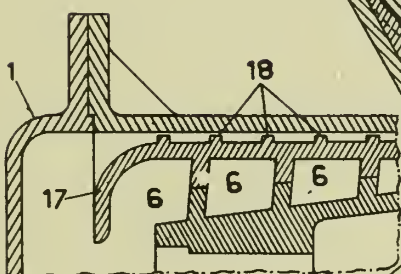


FIG. 11

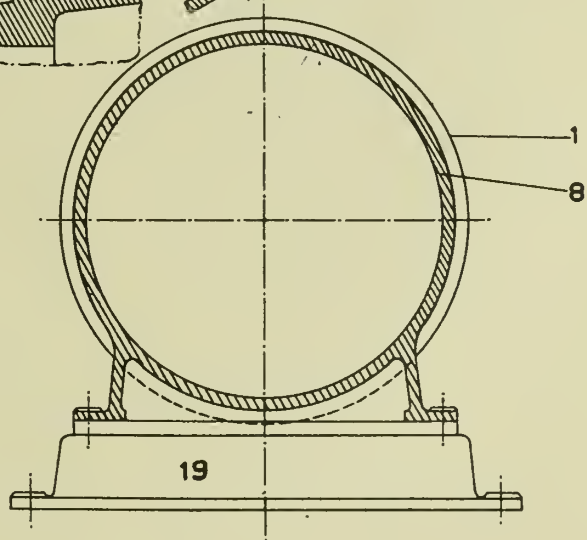


FIG. 10

INVENTOR:
ALEX FREDERIK GEORGE GLASER
BY Haseltine, Lake & Co.
ATTORNEYS

ALIEN PROPERTY CUSTODIAN

MEANS FOR INFLUENCING THE CONDITIONS OF FLOW, PARTICULARLY FOR POWER PLANTS IN AIRCRAFTS

Heinrich Neumann, Günther Bukowski, Reinhard Ramshorn, Munchen, Erwin Spiegel, Berlin-Charlottenburg, and Hans Tonn, Berlin-Treptow, Germany; vested in the Alien Property Custodian

Application filed January 8, 1941

The regulation of the air passage through the fairing of covered bodies, particularly of faired air-cooled power plants of aircrafts, hitherto has been effected by regulating the quantity of air flowing through the fairing by the provision of inlet and outlet port areas capable of being controlled. The conditions of flow in the upstream region of the fairing and in the encompassing air stream have not been taken into account.

The invention has found that with faired bodies of the type mentioned it is of essential importance to take into consideration, eventually by regulating the inlet and outlet cross-sections of the fairing, the outside conditions of flow by intentionally influencing, according to the invention, at least the airflow encompassing the fairing by regulating its direction and velocity. This knowledge is based on the following considerations:

The conditions of flow at the upstream side of a body, e. g. a faired power plant, through and over which air is passing, are depending upon the flow of air therethrough and the flight speed. The regulation of the air passing through, which on its part is depending upon the dynamic pressure prevailing anterior to the body and the reaction pressure back of the body i. e. of the pressure drop within the body, has been effected hitherto only by varying the inlet and outlet cross-sectional areas.

The reactions due to changes in the amount of air passing through the body on the upstream side of the airflow and on the airstream encompassing the faired body are so remarkable that with increasing flight speeds a close study of these problems is indispensable. The proportion of the loss in efficiency met with bodies through and over which the air is passing at velocities of e. g. more than 500 kms p. h. is scarcely 20% in the interior of the body of faired air-cooled power plants in comparison with the losses outside the body. From the preceding is resulting the necessity, just in the case of a small amount of air flowing through faired bodies of the kind described i. e. when keeping the quantity of the cooling air passing through the body within economical limits, to pay the utmost attention on the conditions of flow of the encompassing airstream and at the upstream side of the fairing.

The airflow anterior to a body of the kind described above, with a fairing of known form and eventually with means for controlling the flow of air through the body for limiting the cooling air passage, shows a region of slowed down flow setting up itself in front of the body. This region of flow has the form of a body of revolution along the limit surface of which is moving the outer airflow. The more the adjustment is for a smaller amount of air passing through the body and the higher the flight speed, the steeper the contour of this body of revolution is ascending against the outline of the faired body. Hence it follows that to the outer airflow moving along the body of revolutions (boundary line of flow) before encompassing the faired body is imparted a very marked angular deviation. This will cause in the outer airflow on the faired body a crowding of the lines of flow i. e. a local increase of velocity and lateral forces. These lateral forces are in the main responsible for the high loss in power for surmounting the drag.

These losses are avoided, according to the invention, by designing and arranging the fairing in such a manner, that the velocity of the airflow encompassing the fairing is influenced as to its amount and direction and this in such a way, that up to its largest cross-section no accelerations of the airflow increasing the velocity of the air encompassing the body considerably above the flight speed are occurring i. e. the angular deviation of the airflow is intentionally kept small.

In case the velocity of the throughflowing air is slowed down in front of the inlet cross-section of the fairing, the conditions of flow at the upstream side of the body are improved, according to the invention, in such a way that the boundary line of flow of the slowed down airflow by correspondingly outlining the fairing and eventually its regulating parts parts is flattened early enough that the air passing over the edge of the inlet port of the fairing shows a course without accelerations i. e. a continuous course. The flattening of the boundary line of flow can be effected by a streamlined displacement body capable of being displaced into the upstream region in the direction of axis of the fairing anterior to the port area of the fairing, in the following called "aerodynamic body." Further it is possible to flatten the boundary line of flow by designing the fairing or parts of it capable of being controlled axially and/or as to their diameter in proximity to the inlet port area relatively to the aerodynamic body or by producing a branched off partial stream attuned to the velocity character of the throughflowing air for flattening the boundary line of flow, so that the said boundary line of flow encompassing the throughflowing air and the partial stream is displaced outwardly i. e. flattened in accordance with the intensity of the partial stream. The branching of a partial stream can be effected on the displacement body or in the vicinity of the border of the inlet port of the fairing by a corresponding subdivision in such a way that nozzle-like conduits are produced, the cross-sectional area of which is larger at the inlet of the branched off partial stream than their outlet cross-sectional area.

Owing to the flattening of boundary line of flow the angle between the oncoming outer air and the fairing to be encompassed is reduced to such a degree that the lateral forces in the outer air flow diminish i. e. the depression zone in the vicinity of the border of the inlet opening is declining.

A further development of the invention is procuring the possibility of influencing the conditions of flow at the upstream side of the fairing by outlining the fairing in such way and by placing the inlet port area for the throughflowing air at such a distance in front of the fairing into the upstream region of flow, that due to the geometrical form the angles between the oncoming airflow and the fairing resp. the angular variation on the way covered by the airflow is kept small and thus no sudden accelerations of the airflow encompassing the fairing from the branching point to the largest cross-section of the fairing are occurring. With fairings of the kind described a more and more declining zone of slowed down flow is produced anterior to the inlet port, the more the inflow velocity of the through flowing air into the fairing is attuned to the velocity of the encompassing airflow at the branching point.

A markedly forward extending fairing designed in accordance with these points of view, the inlet cross-section of which e. g. is dimensioned for an inflow velocity in accordance with the climbing speed can be improved e. g. by displacing the already mentioned aerodynamic body into the upstream part of airflow, so that with a higher flight speed in no case a slowing down of the oncoming airflow is occurring at the regulating point. In this manner the losses at the branching point of the throughflowing and the encompassing airflow can be reduced to a minimum owing to the tuning of the throughflow velocity to the velocity of the encompassing airflow.

As the amount of air passing through a faired body, particularly through faired air-cooled power plants must be controlled in dependence upon the engine performance whereas the inlet and/or outlet cross-sections of the fairing besides that must be regulated corresponding to the attitude of flight, particularly in the case of lower dynamic pressures during climbing and as the velocity of the upstream part of the airflow is varying according to flying attitude and performance, it is necessary to control the velocity of the air stream flowing against, over and through the fairing dependently on the flight speed, the performance conditioned throughflow of air and eventually on the attitude of flight. Controlling of faired bodies with a reduced velocity of the oncoming airflow can be done by displacing or the aerodynamic body into the oncoming airflow or the fairing relatively to aerodynamic body or by varying the dimensions of the superimposed, branched off partial stream in accordance with the operating conditions. The regulation can also be effected by a combination of a variation of the branched off partial stream with the adjustment of the aerodynamic body resp. of the fairing.

With faired bodies through and over which an airflow is travelling and in which the inflow velocity of the air flowing through the fairing is equal to the flight speed i. e. with bodies, with which the airflow in the upstream region is practically not slowed down, controlling may take place in such a manner, that the velocity of through-flowing air stream at the inlet port into the fairing, no matter the amount of air passing through, is approximately equal to the actual velocity of the encompassing airflow in all flying attitudes.

Some examples of construction with the essential parts of the invention are shown in the drawings, wherein;

Fig. 1 is a section through a power plant fairing provided with a tractor propeller,

Fig. 2 a section through a fairing with automatic control means,

Figs. 3–4 a section through a propeller cap, the inlet port area of which is automatically controlled in such a way that the velocity of the throughflowing air stream is the same as that encompassing the fairing,

Figs. 5–7 are other forms of embodiment in section,

Fig. 8 is a section through a fairing with an aerodynamic body capable of being controlled in accordance with the dynamic pressure during flight taking into consideration the different angles of attack.

Figs. 9–10 is a fairing in which the throughflow of air is controlled in stages.

Figs. 11–12 is a fairing with an undivided inlet port area and automatic control means,

Figs. 13–15 forms of embodiment of the regulating means of a fairing in section.

Fig. 16 is a front view of Figure 15.

The aircraft power plant (not represented), faired with the cowling 1, is provided in the example of construction with a traction screw 2, the roots of which are provided with a special fairing 3, which may be shaped in the manner of a fan. On the propeller hub or a part of the propeller a fairing 4 is provided merging into the cowling 1. The propeller hub fairing 4 is in the example of construction mounted for rotation on an extension 5 of the propeller hub casing by means of bearings 6. The fairing 4 is provided interiorly with special ribs or webs 7 extending preferably radially in the direction of the axis of the fairing. Within the fairing at these webs 7 a special cup 8 is provided, which is preferably of annular form and tightened against the propeller hub, with which a streamlined body 9 is engaging, which latter can be displaced according to the circumstances through the orifice of the fairing 4 into the upstream region for influencing the encompassing and throughflowing airstream. The mounting of the body 9 is preferably on rolls 10 rolling on the edges of the webs 7. Within of the body 9 a returning force in the form of a helical spring 11 is provided, which preferably compensates the frictional resistances of the body 9. The value of the returning force can be varied by a particular adjustment device 12. The body 9 is provided in the direction of flight with an aperture 13, through which the dynamic pressure is permitted to enter. The dynamic pressure entering the body 9 through the aperture 13 will displace the body in the direction of flight. The displacement of the body 9 is effected automatically, i. e. only in accordance with the attitude of flight (dynamic pressure, angle of inclination and want of cooling air). The mode of operation is as follows:

With the climbing aircraft, the body 9 is abutting in its deepest position within the fairing 4 eventually on the bottom of the cup 8. In this position to the spring eventually may be given a pretension. The pretension can be varied according to the different seasons to take into ac-

count the different outside temperatures. When climbing the dynamic pressure and hence the deviation of the encompassing airstream is not considerable, so that the body 9 is advanced only immaterially out of the fairing 4, a further undesired displacement of the body 9 during climbing being prevented owing to the inclined position of the aircraft. Thus it is always possible to adjust the desired inlet port area between the body 9 and the fairing 4 for the passage of the cooling air under the point of view, that the throughflow velocity is equal to that of the encompassing air, which latter is eventually equal to the flight speed.

The webs 7 are preferably acting as guiding surfaces within the fairing 4 and arranged at such an angle that with increasing throughflow of air within the fairing 4 the latter is preferably to rotate opposite the direction of rotation of the propeller. In this manner the delivery output of the fairing 3 of the propeller acting as blower is considerably increased, as the air supplied to this blower, is delivered under a certain angle, which is variable with the flight speed, the air density and the adjusted throughflow of air. In this manner behind the blower a course of flow approximately in the direction of axis is produced and eventually a reduction of the controlling path of the body 9 is obtained by the blower action of the fairing 4.

If the aircraft is passing into level flight and the flight speed is increased, then the dynamic pressure within the body 9 is likewise increasing, so that it is further displaced out of the fairing 4 into the upstream region of the fairing. The body 9 and the fairing 4 are so dimensioned that the boundary line of flow between the body 9 and the fairing 4 is flattened and that further the throughflow velocity of the air entering the fairing 4 is equal or approximately equal to the velocity of the airflow encompassing the fairing 4. When the aircraft is more or less diving the body 9 completely leaves the fairing 4 and the inlet port area can be completely or partly closed in order to reduce the total resistance still further, as in this attitude of flight the throughflow of air can be kept very small or completely cut-off.

The mounting of the body 9 by means of rollers 10 in the manner of a car results in a favourable guide and causes little friction losses. It is of course possible for the fairing 4 and the aerodynamic body 9 instead on a bearing 6 to be mounted for free rotation anterior to the propeller, or to drive the fairing through an interposed gearing oppositely to the direction of rotation of the propeller, eventually with a higher speed than the propeller in order to increase, as already mentioned, the action of the guiding surfaces 7.

Figure 2 shows an embodiment similar in its principles to Figure 1, however with the difference that the body 9 is adjusted automatically in accordance with the velocity of the through flowing air and the flight speed. For this purpose the body 9 is provided in the fairing 4 with a rear wall 14. With the rear wall 14 a conduit 15 is connected, in which may be inserted for an additional damping not represented throttle members or the like, to avoid oscillation. The conduit 15 can be extended up to the inlet port area and exposed to the total pressure of the through flowing air. The body 9 with the rear wall 14 is movably mounted on an extension 16. One end of the extension 16 is connected with a partition wall 17 subdividing the body 9 into two chambers, of which the chamber 18 is directly exposed to the dynamic pressure, whilst in the chamber 19 through the conduit 15 the total pressure of the throughflowing air is prevailing. The pressure in the chamber 19 can be counteracted by a special traction spring 20. The measuring point of the conduit 15 can be placed so that the return spring must not be too strong.

Owing to the fact that the body 9 is displaced into its upstream region by the difference between the dynamic pressure acting on it and the total pressure of the throughflowing air, the velocity of the throughflowing air is adjusting itself in all attitudes of flight approximately equal to the velocity of the airflow encompassing the fairing 4.

The following figures show the possibility of attuning the throughflow to the flight speed, with a further readjustment of the rate of throughflow.

Fig. 3 is representing a fairing, in which by means of a number of measuring points the inlet port area of the fairing is varied in accordance with the flight speed. In the example of construction the front part of the fairing, preferably consisting of resilient material or a plurality interengaging parts, are pivoted about the fulcrum 25 through the intermediation of the spring 21, the intermediate piece 22, the disc 23 and the arms 24. Owing to this pivoting motion the inlet cross-section is completely opened as represented by the position shown in dotted lines. With increasing flight speed an increasing dynamic pressure is produced anterior to the aerodynamic body 9 which is no longer movable in the direction of axis, prevailing through the conduit 26 also in the chamber 27 and acting in the sense of a diminution of the inlet cross-section on the disc 23 and hence on the spring 21. The disc 23 is tightened against the rear wall 14 of the fixed body 9 by a particular diaphragm joint. In order to obtain a far-reaching and automatic equalisation of velocity of the air flowing through the annular inlet opening to the velocity of the air flow encompassing the fairing part 4, the room enclosed by the aerodynamic body 9 is subdivided in two chambers 28 and 29. The chamber 28 is in communication with the inlet cross-section through one or more apertures 30 within the region of said inlet port area, whereas the other chamber 29 is in communication with the external airflow through special conduits 31. The subdivision of the aerodynamic body 9 is effected by the arrangement of a diaphragm 32, which is rigidly connected with the body 9 and a sleeve 33 slidable in the direction of axis. The sleeve 33 is provided with an opening 35, which is in connection with the inlet conduit 26 through a movable intermediate member 36 and an aperture 37.

In the case of overpressure in the chamber 29 relatively to the chamber 28 the sleeve 33 is displaced in the direction of flight by the diaphragm 32 i. e. when in comparison with the velocity of flow of the atmosphere the velocity of flow of the air passing through the fairing is too high. The sleeve 33 is finally brought into a position, in which the air can escape from the inlet conduit 26 through the apertures 38, 35, 37 and the intermediate member 36 into the inlet passage. In this position the pressure in the chamber 27 is diminishing. The disc 23 is now displaced by the spring 21 in the direction of flight, which causes a pivoting motion of the fairing part 4 with the help of the arm 24 about the fulcrums 25 with a view to enlarge the inlet port area. Owing to

this enlargement of the throughflow cross-section the velocity of the throughflowing air is reduced and the pressure in the inlet conduit and in the chamber 28 increased. The sleeve 33 is then displaced in the direction of axis oppositely to the direction of flight and the aperture 28 is closed.

By properly designing the different control parts it is possible taking into consideration the controlling force of the spring 21 and the conditions of flow prevailing during operation and the pressures occurring in the different above mentioned chambers, to establish any desired ratio between the velocity of the air passing through the fairing and the velocity of the air encompassing the fairing. It is further possible to design the control parts for the regulation of the inlet port area so that the inlet velocity of the throughflowing air is approximately always equal to the velocity of the airflow encompassing the fairing 4 and the latter eventually equal to the flight speed.

In Figure 4 the regulation of the interiorly arranged sleeve 33 is effected in a similar way as in Figure 3 by a diaphragm 32, which is exposed on the one hand to the influence of the dynamic pressure anterior to the aerodynamic body 9 and on the other through the conduit 39 to the influence of the total pressure in the inlet cross-section. The diaphragm 32 can be simultaneously submitted under the influence of a spring 21.

In order to control the dimensions respectively the position of the inlet, the fairing 4 can be given a variable cross-section or can be displaced, as shown in the example of construction of Figure 3, with the help of a linkage 40 pivotally connected to a sleeve 41. The sleeve 41 is arranged slidably in the direction of axis and submitted simultaneously to the influence of a spring 42 acting in the direction of an enlargement of the inlet cross-section and to the influence of a further diaphragm 43, which on its part is influenced by the pressure in the inlet cross-section and the dynamic pressure anterior to the aerodynamic body 9, which also in this case cannot be moved. With an increasing dynamic pressure the pressure in the space 44 in front of the diaphragm 43 is increasing, so that with increasing flight speed the sleeve 41 is displaced in the direction of a variation of the inlet cross-section against the action of the spring 42. If the velocity of the throughflowing air and hence the total pressure in the conduit 39 is too high, the sleeve 33 is displaced in the direction of flight. Thus a communication is established with the inlet conduit through the apertures 35, 33, the conduit 36 and the aperture 37, so that the pressure in the cham- 44 is diminishing. The sleeve 41 is then again displaced in the direction of flight and the fairing 4 moved outwards through the linkage 40. This will be followed by an enlargement of the inlet cross section and by reduction of the velocity of the throughflow in the inlet, so that also the pressure in the conduit 39 is diminished.

Instead of varying the inlet passage of the fairing 4 through the linkage 40, in a similar way as in Figure 3, it is also possible to design the fairing 4 in such a manner that said fairing or eventually parts of it can be rotated for uncovering not represented inlet apertures. This form of construction permits short control paths. In this example of construction the diaphragm 32 is serving as readjusting device in case no equalisation of the throughflow velocity to the flight speed has been effected by the diaphragm 43.

The arrangement represented in Figure 5 is so designed that the inlet cross section is automatically controlled, i. e. in dependence upon two measuring points, in order to make the regulation independent of altitude and speed of flight. This embodiment has further the advantage of responding immediately to any variation of the throughflow of air. In the example of construction of Figure 5 the body 9 is mounted in the fairing and movable in the direction of axis. The body 9 can be mounted as in the other examples of construction on an extension 16 and a wall 17 with the interposition of a returning force 20, acting in the direction of an enlargement of the inlet cross section. The actual position of the body 9 and eventually also the cross sectional area is depending upon the pressures prevailing in each case in the chambers 18, 19. Both chambers 18, 19 can be alternately put in communication with the conduit 26 opening in the region of dynamic pressure of the body 9. The sleeve 33 provided with transfer passages 45 and 46 and rigidly connected with a diaphragm 32 is serving as controlling means. This diaphragm is adjusting the control sleeve in the direction of axis, in accordance with the pressure in the inlet conduit and the pressure in the atmosphere. The control sleeve 33 and the transfer passages 45, 46 are so designed that according to the position of the sleeve the chamber 18 or 19 is in communication with the conduit 26, whilst the other chamber 26 or 25 is in connection with the inlet conduit through the intermediate member 36 and the port 37.

The spring 20 has the task to bring the fairing parts serving to vary the airflow anterior to and encompassing the fairing e. g. into a position, in which the position of the inlet respectively passage cross section is corresponding to the conditions of climbing. The tension of the spring is counteracted during the flight by the dynamic pressure. The control means can be so designed that either for regulating the cross sectional area only the spring tension and the dynamic pressure are used or that for a more complete equalisation of the throughflow velocity to the velocity of the encompassing airflow particular control members are provided, which can be designed according to the already described forms of embodiment, in order to effect the adjustment of the body 9 or of the fairing respectively particular parts of the fairing with the help of the pressure or the pressure drop within the body 9. Further the example of construction of Figure 5 is corresponding in its action to that of Figure 3 only that instead of one measuring point 30 there are provided two or more measuring points in the example of construction of Figure 5 and not the fairing 4, but the aerodynamic body 9 is movably mounted.

Figure 6 shows an example of construction with a likewise movable streamlined body 9 in a fairing 4, similar to the example of construction of Figure 5. The dynamic pressure reaches through the conduit 26 the cup-like end member 8 and acts upon the rear wall 14. This will effect the displacement of the body 9 into the upstream region of airflow against the action of the spring 20. The inlet cross sectional area between fairing and aerodynamic body can be reduced by increasing the velocity of the branched-off throughflow as long as it will correspond to the velocity of the encompassing air flow respective-

ly the flight speed. It is of course also possible to design the aerodynamic body 9 so that during its displacement the inlet cross sectional aera is not submitted to any further variation, but only the airflow anterior to the fairing, flowing through the fairing, and encompassing the fairing is influenced. This regulation is corresponding by principle to the examples of construction of Figures 3 and 5, however with the difference that the control sleeve 33 in the position, in which the apertures 38 and 35 are in communication with the space, enclosed by the cup 8, simultaneously closes the transfer passage 47 serving to deliver air into this space. The aperture 35 of the sleeve valve 33 is connected through the intermediate member 36 and the aperture 37, as shown in the example of construction of Figure 5, with the space within the fairing 4. The diaphragm 32 corresponds in its action to that of Figs. 3 and 5. The chamber 28 can be connected, as shown by the conduit 48 in dotted lines, besides the two measuring points 39 with a further measuring point 49, which takes into account e. g. the marginal flow within the fairing.

The example of construction of Figure 7 does not differ essentially from the above examples of construction, so that the parts of same action have the same reference numerals. The difference consists only in the fact that for the readjustment the chamber 28 is exposed through the aperture 50 to the direct influence of the dynamic pressure and the chamber 29 to the influence of the pressure in the inlet cross section through the conduit 15, so that the dynamic pressure can escape through the chamber 28 and aperture 37 in case the aperture 38 is uncovered.

The example of construction of Figure 8 shows a fairing of the power plant similar to that of Figure 2. A streamlined body 9 is displaced in the direction of the upstream region with the help of the dynamic pressure being produced through the conduit 26 in the chamber 18. In the displacement body 9 one or more conduits 51 are provided which permit the corresponding dynamic pressure in dependence upon the actual flying attitude to reach the chamber 19 behind the partition wall 17, for being able to exert a correcting influence on the position of the displacement body 9 according to the flying attitude. In the conduits 26 and 51 in common or in one of them preferably in the conduits 51 a particular throttle member 52, preferably designed after the manner of a rotary valve, can be provided, which uncovers the corresponding conduit according to the flying attitude. The regulation of the throttle member 52 can be effected automatically, e. g. by submitting it to the force of gravity by attaching a weight 53 or the like. In such a case the throttle member 52 uncovers according to the flying attitude, in case said throttle member is controlling more of them, the desired conduit. The regulation of the throttle member can be effected of course, as shown in the examples of construction, particularly those of Figures 3 to 7, also by the pressure drop of a plurality of measuring points by means of a special sleeve valve or the like. The provision of special conduits 51 has the advantage that the displacement body 9 will occupy in any flying attitude according to the airflow the actual most favourable position. By accordingly choicing the overlapping of the apertures of the throttle member 52 an exact tuning of the different regulating motions is possible. For diving, e. g. special abutments can be provided for the counter weight 53, fixing the throttle member 52 in a position, in which the conduit 26 is uncovered. The arrangement of a counter weight controlled throttle member 52 preferably conditions a displacement body 9, which is mounted with its fairing 4, as shown in the example of construction of Figure 1, freely rotatable on the propeller casing or on the propeller hub.

Figures 9 and 10 show examples of construction of a fairing permitting two or more positions of the fairing parts. For this purpose in the fairing 4 and in the air guidance 54, provided within the fairing, one or more annular fairing parts 55 are provided, which, as shown in the example of construction of Fig. 9, when diving, are abutting on the cooling air guidance 54. Only when the aircraft has passed again to its normal flight speed the annular fairing part 55 is displaced forward e. g. in accordance with the dynamic pressure or another regulating value so far into the position shown in dotted lines, that this fairing part forms e. g. with the fairing 4 a continuous way for the air flow. The inlet port area is still more advanced by this measure corresponding the higher flight speed, so that as already discussed above, the throughflow velocity can be attuned to that of the encompassing air flow. For diving or with the power plant cutoff, especially in the case of multi-engined aircrafts, the inlet port area can be completely closed by the movable cap 56.

Figure 10 shows as modification of Figure 9 a further subdivision in two movable fairing parts 55 and 55', in which it is also possible to fix the fairing parts 55, 55' in any intermediate position. The fairing 4 is outlined in this example of construction for accommodating a heat exchange device 57 and of course also can find application in an air-cooled internal combustion engine, e. g. a radial engine. The fairing parts are preferably so designed that in all their regulating positions within the fairing and the cooling air guidance 54 a passage is formed diverging in the direction of the heat exchange device 57.

The fairing of this kind has the advantage that among other things during climbing the cooling air will enter always at the stagnation point, i. e. the fairing is not sensitive to variations of the angle of attack. Only when the normal cruising speed respectively the maximum speed is attained the conditions of flow are correspondingly taken into account and the inlet port area is so far advanced, as already mentioned, that the region of slowed down flow in front of the fairing is declined as far as possible. The example of construction of Figure 10 has still the advantage that, since the fairing parts 55, 55' are only withdrawn to their full-line position, they can act as twindiffusor in order to reduce in this manner the corresponding conversion-losses, in which case, owing to the subdivision of a fairing of the type described considerable variations of the inlet cross sectional areas are produced notwithstanding the relatively short regulating paths.

The examples of construction of Figure 11 and 12 finally show another automatic displacement of an annular fairing part 55, e. g. in accordance with the dynamic pressure entering through the conduit 59 the aperture 13 into the aerodynamic body 9. The dynamic pressure reaches through the conduit 59 into the chamber formed by the two walls 57 and 58. The walls 57 and 58 are movable so as to telescope one within the other

under the influence of a returning force 20. The wall 58 is in this case connected with the aerodynamic body 9 and can be mounted with the fairing 4 freely rotatable on the extension 5 of the propeller hub. The wall 57 is in connection with the fairing part 55 through recesses in the aerodynamic body 9 and being capable of sliding motion. The dynamic pressure in the chamber between the two walls 57 and 58 has the effect that the cowling part 55 is displaced more or less far into the upstream region according to the flight speed. When arranging the fairing so as to produce anterior to the aerodynamic body 9 still a region of slowed-down airflow, then it is possible by the aid of the movable fairing part 55 in its intermediate positions to influence the boundary line of flow by the fact that a partial stream between the fairing part 55 and the hub fairing 4 is branched-off for circumferentially surrounding the interior flow. In this manner the boundary line of flow is artificially flattened corresponding to the dimensions of the partial stream. Attention must be paid only to the necessity that the inlet cross section for the partial stream is larger than the outlet cross section. In this way the course of the airflow encompassing the cowling 1 shows no discontinuities of pressure. The lower part of Figure 11 shows the position of the fairing part 55 e. g. during climbing.

Figure 12 is a further modification of Figure 11, in which case for the displacement of the fairing part 55 not the full dynamic pressure, but the difference in pressure between the pressure acting outside the fairing 4, e. g. the low pressure and the total pressure prevailing within the fairing part, is used. Within the fairing part 55 a measuring point 56 is provided, discharging e. g. into a chamber formed of two walls 57 and 58 movable telescopically into one another. This chamber is simultaneously in connection with the low pressure zone outside the fairing 4 through the conduit 59. The cross section of the conduit 59 can be varied e. g. manually through a controlling linkage 60 or the like. The ratio of the cross sections of the inlet conduit and the static tube must preferably be so dimensioned that the compensating pressure being produced within the chamber with the static tube completely opened and the inlet conduit partly opened effects a sufficient opening, i. e. displacement of the fairing part 55. A tension spring 20 cares for an automatic return of the regulating parts at a standstill. In order to be able to provide in the case of unforseen circumstances the full opening of the inlet cross sectional area, the total cross section of the inlet conduit 59 is uncovered. This has as a consequence a decrease of pressure within the fairing, so that the fairing part 55 is withdrawn still further into the fairing 4 respectively cowling 1. If there is the danger of the aircraft power plant being excessively cooled, the fairing part 55 is then displaced more in the direction of the upstream region by throttling the conduit 59 eventually as far as the inlet cross section is completely closed. The fairing part 55 can be connected through a special linkage 61 with the body 9 and the fairing 4 as is further to be seen in the example of construction of Figure 12. This connection has the advantage that e. g. with a movable body 9, according to the choiced transmission ratio, owing to the position of the articulation points on the linkage 61 a favourable influence on the conditions of flow is possible with relatively small movements.

In the examples of construction of Figures 13 to 16, in which the inlet cross section and the fairing are designed deliberately in such a way that the velociay of the throughflowing air is equal to the velocity of the airflow encompassing the fairing and eventually equal to the flight speed. In order to be able in particular flying attitudes, specially in climbing to attune the throughflow velocity again to the flight speed, among other things the inlet cross section of the fairing can be varied. This is effected, according to the invention, by pivotally arranging the fairing 4 or essential parts of it about the axis 25, in a similar way as shown in the examples of construction of Figure 3 and 4. For this purpose the fairing 4 is circumferentially subdivided and eventually provided with a resilient cover. The fairing and regulating means for its cross section can be mounted in this case freely rotatable on an extension or the like of the propeller, as in the other examples of construction. The control members are preferably guided through their axle in case an automatic regulation is not desired.

A further development shows the example of construction of Figure 14. In this form of embodiment particular openings 62 are provided in the fairing 4, which can be opened or closed by means of a plurality of sleeves or a common sleeve 63, preferably of annular form. Within the fairing 4 a further cone-shaped fairing part 64 can be provided. Between this fairing part 64 and the fairing 4 is preferably mounted the sleeve 63, which may co-operate with the cone-shaped fairing 64 in such a way that the openings provided in the latter are more or less uncovered. According to the position of the sleeve 63 the inlet cross-sectional area of the fairing 4 and hence the throughflow velocity is varied.

The example of construction of Figure 15 is likewise a further development of Figure 13, the pivotable fairing part 4 is however co-operating with the preferably non-movable, cone-shaped fairing part 64 mounted within the fairing in such a manner that in the closed position only the inlet cross-sectional area between the fairing part 64 and the aerodynamic body 9 is uncovered. This position may correspond to the normal cruising speed. For other flying attitudes, e. g. for climbing, the exterior fairing part 4 is pivoted in the direction of arrow, as shown in the upper part of Figure 15, and the inlet cross-sectional area correspondingly increased. The passage formed between the fairing 4 and the fairing 64 further can be so choiced that its inlet cross-sectional area is larger than that of its outlet in case it is desired to use in the intermediate positions the partial stream branched-off by this passage for flattening the boundary line of flow. It is possible to design the pivotable fairing part 4, as shown in Figure 16 in a front view, consisting of two interengaging parts, in which case the pivoting device, in case the fairing system is mounted in the wing of an aircraft, is arranged in the direction of this wing. This has the advantage that no unfavourable influence on the conditions of flow of the wing section is to be expected.

HEINRICH NEUMANN.
GÜNTHER BUKOWSKI.
REINHARD RAMSHORN.
ERWIN SPIEGEL.
HANS TONN.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

H. NEUMANN ET AL
MEANS FOR INFLUENCING THE CONDITIONS OF FLOW, PARTICULARLY FOR POWER PLANTS IN AIRCRAFTS
Filed Jan. 8, 1941

Serial No. 373,622

8 Sheets-Sheet 1

Fig. 1

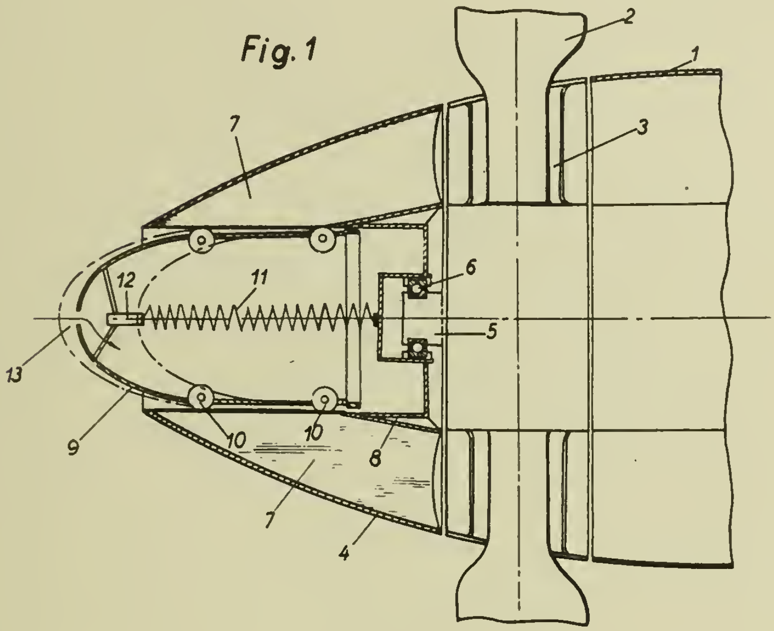
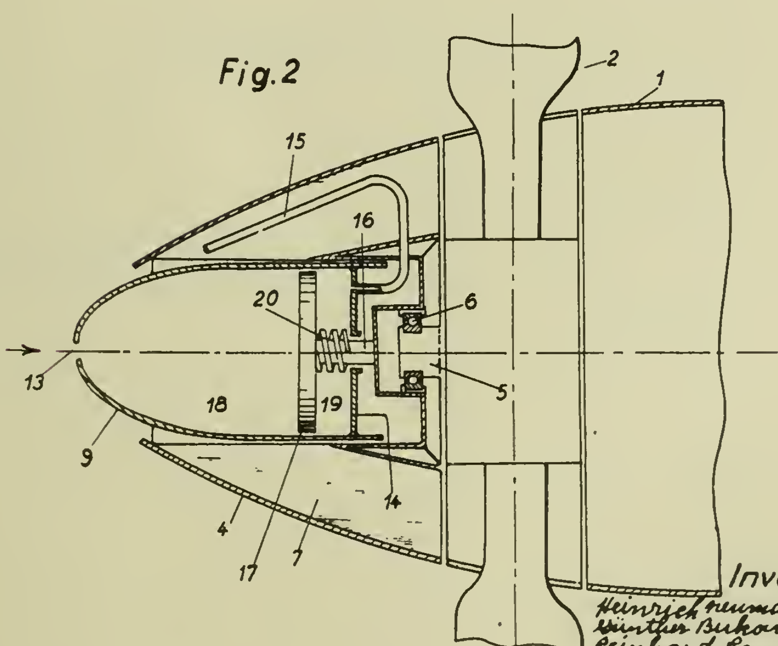


Fig. 2



Inventors
Heinrich Neumann,
Günther Bukowski
Reinhard Ramshorn
Erwin Spiegel
Hans Tonn by
Knight attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

H. NEUMANN ET AL

MEANS FOR INFLUENCING THE CONDITIONS OF FLOW,
PARTICULARLY FOR POWER PLANTS IN AIRCRAFTS

Filed Jan. 8, 1941

Serial No.
373,622

8 Sheets-Sheet 2

Fig. 3

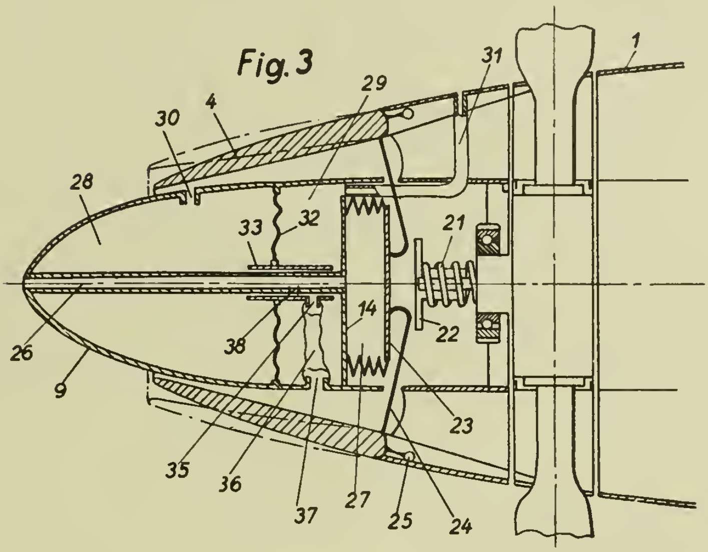
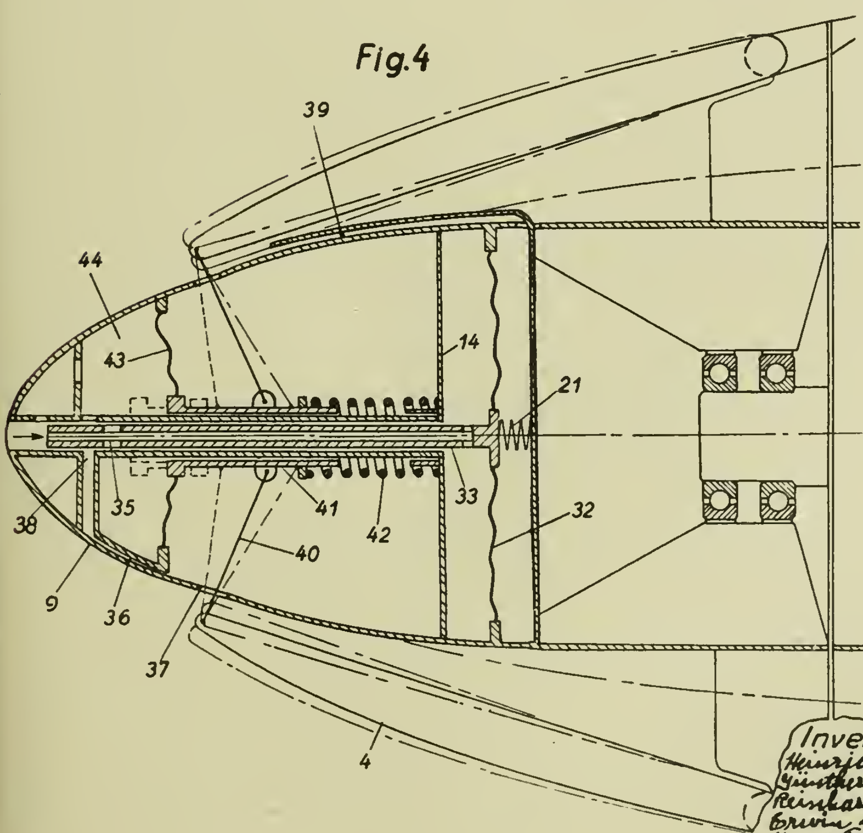


Fig. 4



Inventors
Heinrich Neumann
Günther Bukowski
Reinhard Kumsporn
Erwin Spiegel
Hans Tourn
by Knight attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

H. NEUMANN ET AL

MEANS FOR INFLUENCING THE CONDITIONS OF FLOW, PARTICULARLY FOR POWER PLANTS IN AIRCRAFTS

Filed Jan. 8, 1941

Serial No. 373,622

8 Sheets-Sheet 3

Fig. 5

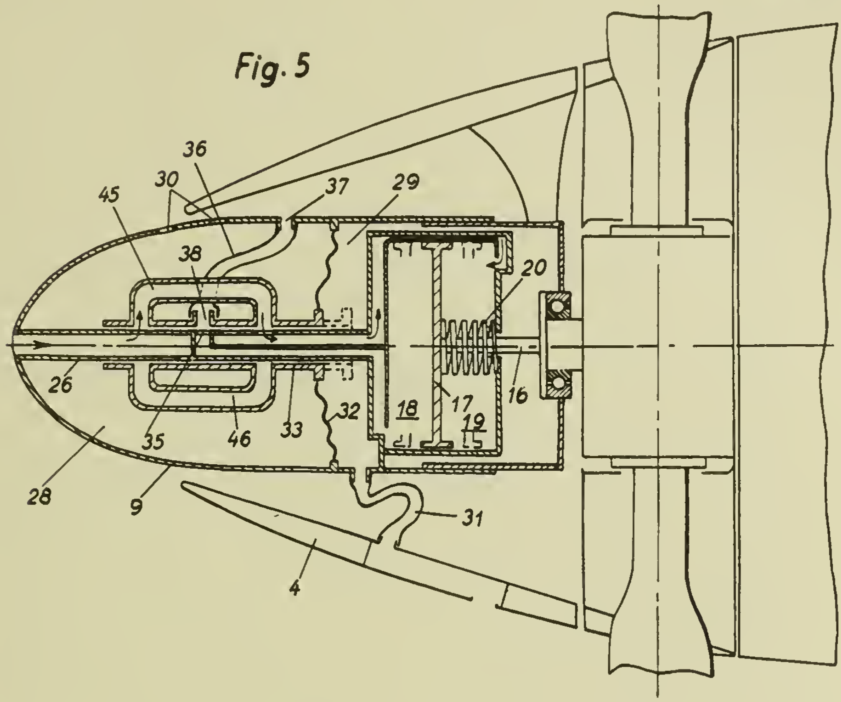
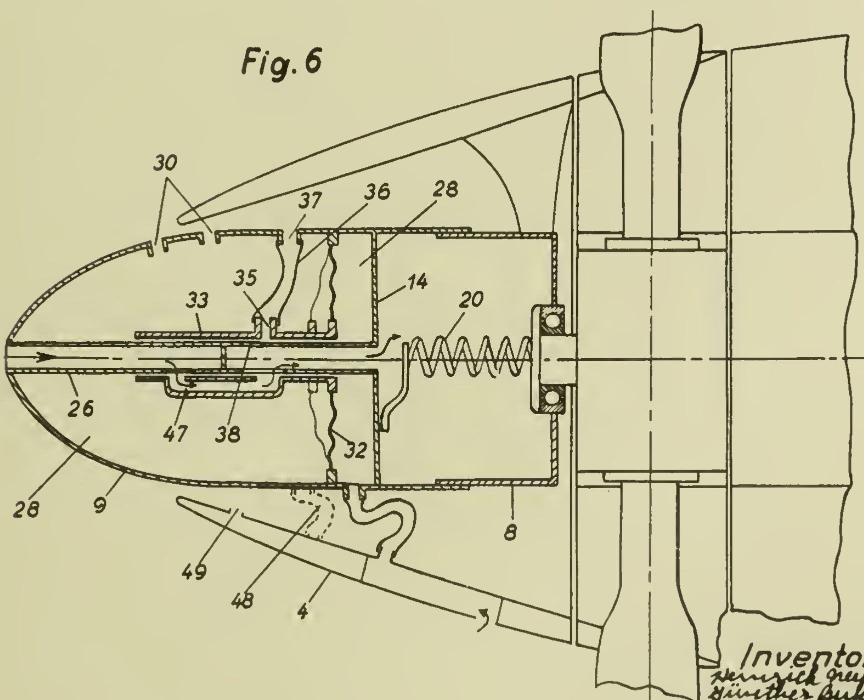


Fig. 6



Inventors
Heinrich Neumann
Günther Bukowski
Reinhard Langhorn
Erwin Spiegel
Hans Zorn
by Knight Attys.

Fig. 7

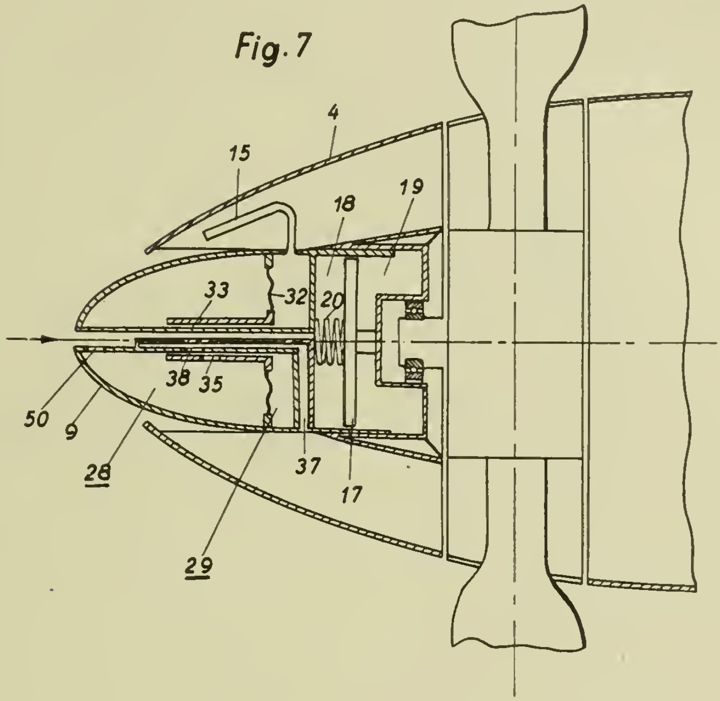
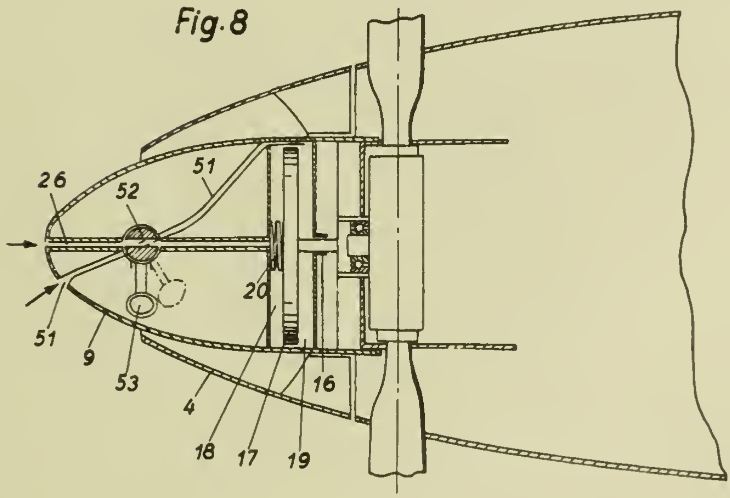


Fig. 8



Inventors
Heinrich Neumann
Günther Bukowski
Reinhard Ramshorn
Erwin Spiegel
Hans Ton...
Knight attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

H. NEUMANN ET AL

MEANS FOR INFLUENCING THE CONDITIONS OF FLOW, PARTICULARLY FOR POWER PLANTS IN AIRCRAFTS

Filed Jan. 8, 1941

Serial No. 373,622

8 Sheets-Sheet 5

Fig. 9

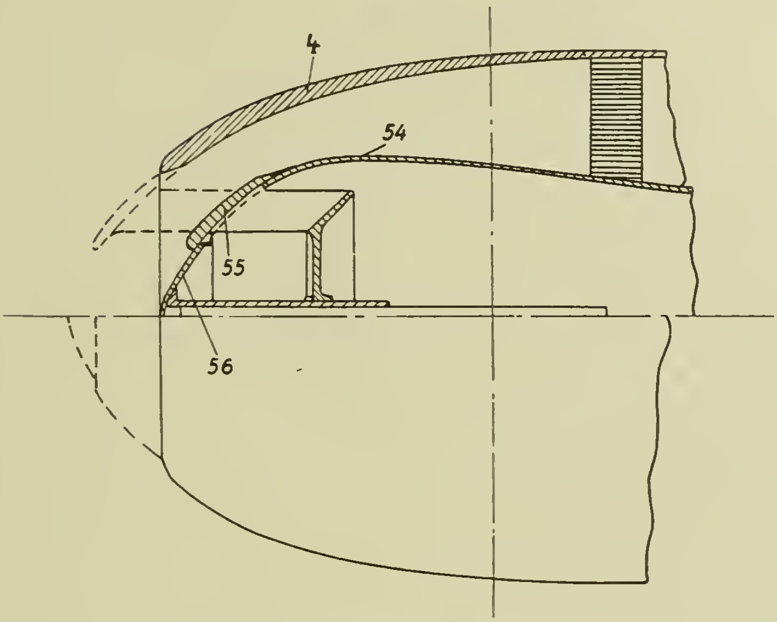
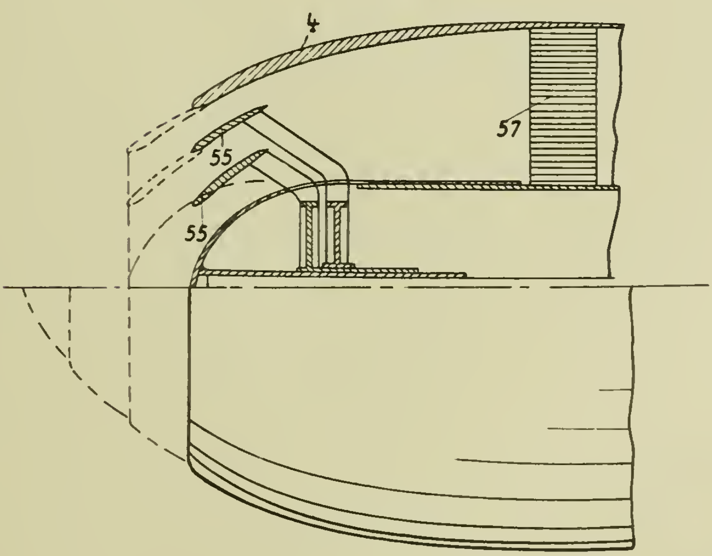


Fig. 10



Inventors
Heinrich Neumann
Günther Bukowski
Reinhard Ramshorn
Erwin Spiegel
Hans Torn
by Knight Bros attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

H. NEUMANN ET AL

MEANS FOR INFLUENCING THE CONDITIONS OF FLOW, PARTICULARLY FOR POWER PLANTS IN AIRCRAFTS

Filed Jan. 8, 1941

Serial No. 373,622

8 Sheets-Sheet 6

Fig. 11

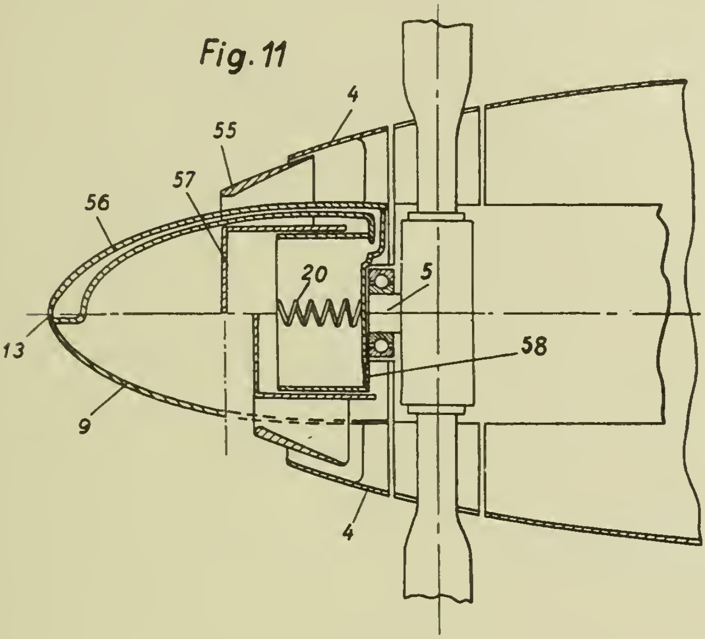
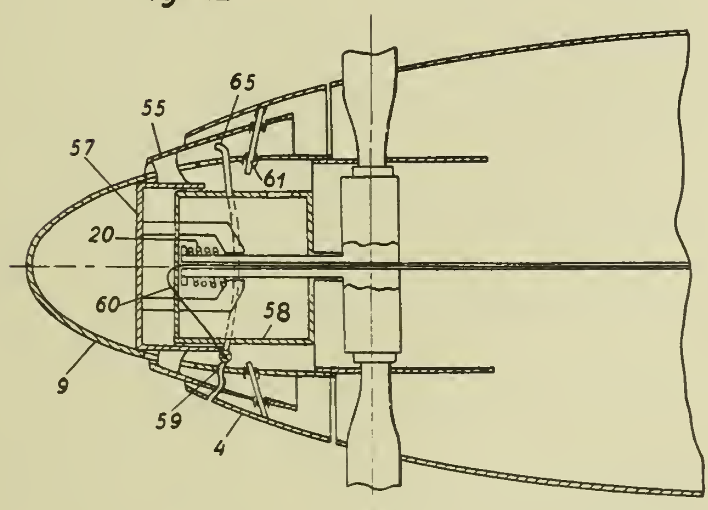


Fig. 12



Inventors
Heinrich Neumann
Günther Bukowski
Reinhard Ranghorn
Erwin Spiegel
Hans Togni
by Knight Atty.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

H. NEUMANN ET AL

MEANS FOR INFLUENCING THE CONDITIONS OF FLOW, PARTICULARLY FOR POWER PLANTS IN AIRCRAFTS

Filed Jan. 8, 1941

Serial No. 373,622

8 Sheets-Sheet 7

Fig. 13

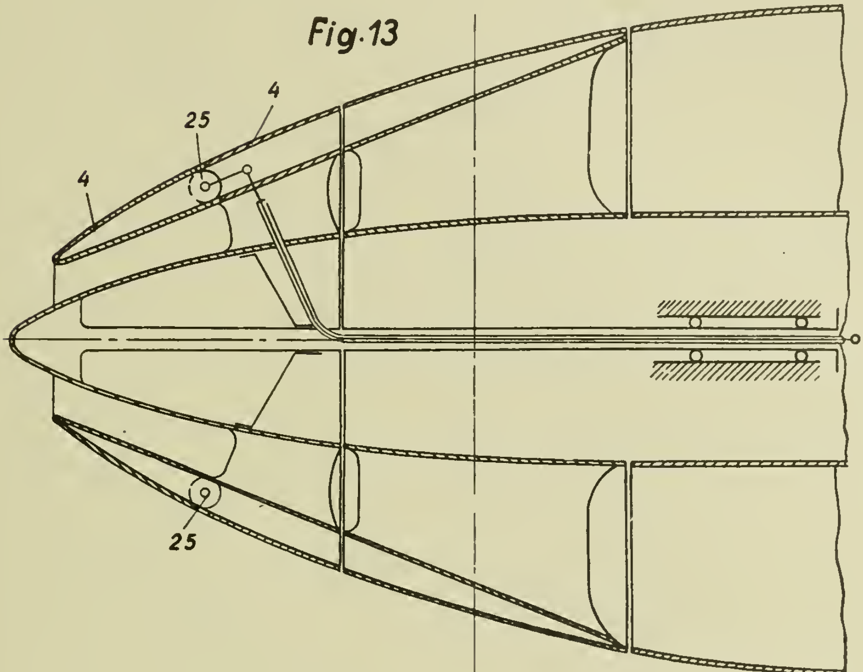
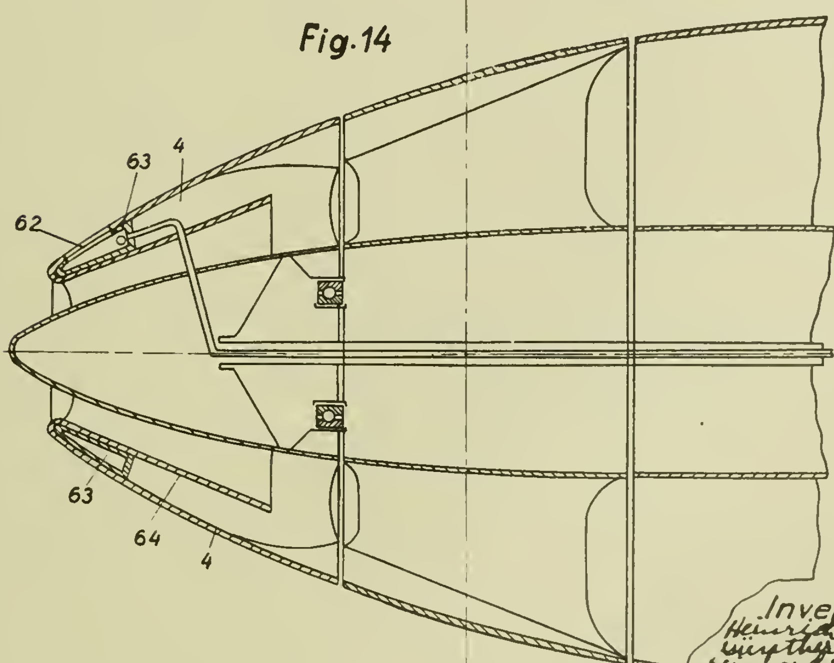


Fig. 14



Inventors
Heinrich Neumann
Günther [illegible]
Reinhard [illegible]
Erwin Spiegel
Hans [illegible]
by Knight Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

H. NEUMANN ET AL
MEANS FOR INFLUENCING THE CONDITIONS OF FLOW, PARTICULARLY FOR POWER PLANTS IN AIRCRAFTS
Filed Jan. 8, 1941

Serial No.
373,622
8 Sheets-Sheet 8

Fig. 15

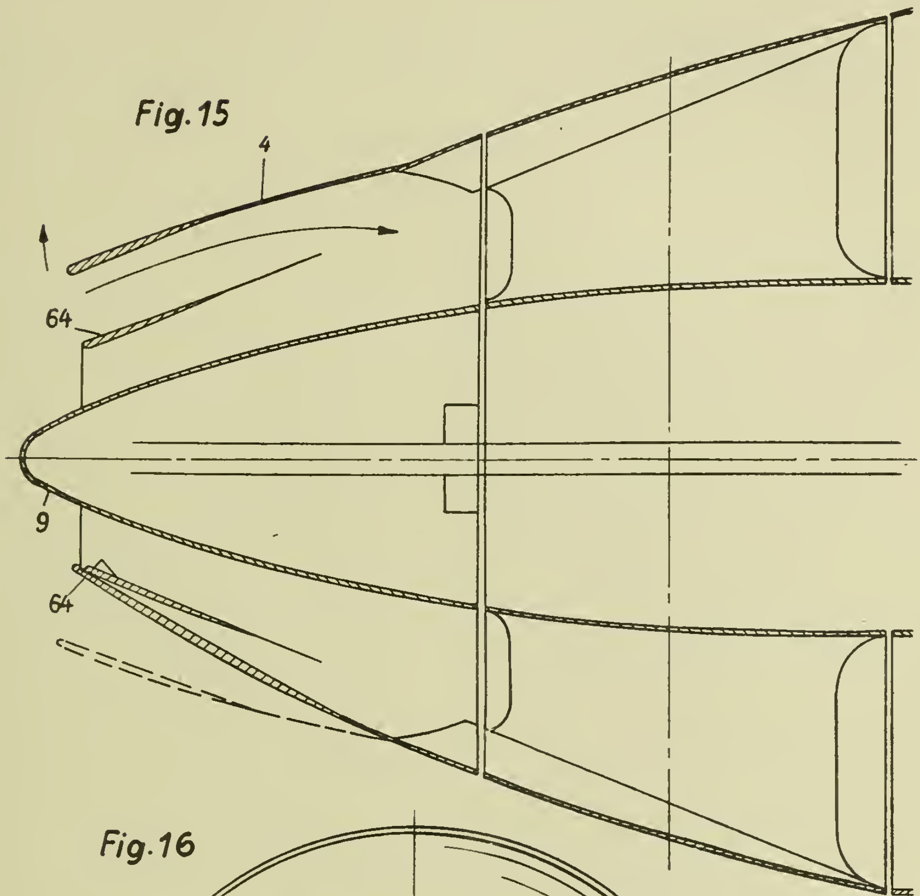
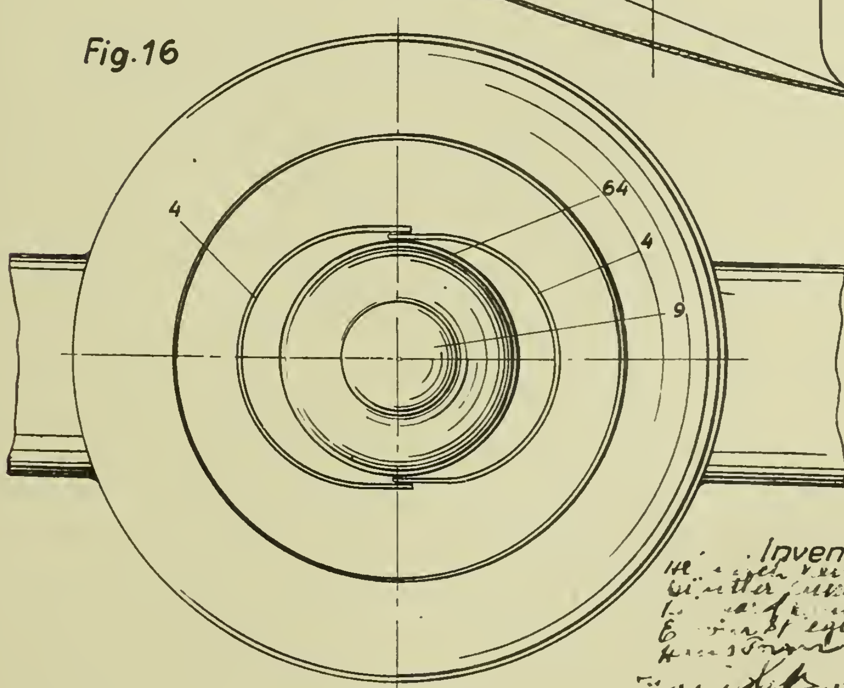


Fig. 16



Inventors

Published May 25, 1943 Serial No. 373,714

ALIEN PROPERTY CUSTODIAN

FIGHTER PLANES

René Fonck, Paris, France; vested in the Alien Property Custodian

Application filed January 9, 1941

It is a known fact that at the present time, the firing apparatus (machine guns or cannons) used by the pilots of a fighter plane, are secured to the avion in such way as to form part of the same, and the pilot directs his fire by directing the avion itself. In the two-seaters, in which a gunner is situated in the rear of the pilot, the fighting apparatus used by the gunner are not rigidly mounted on the avion, and the gunner is situated in a turret which allows him to direct his arms at will. It is shown by experience that an avion thus equipped will often be in conditions which are defective when acting against an enemy plane coming in the rear.

The object of the present invention is to overcome such drawbacks and to provide a fighter plane having a great effectiveness for firing.

For this purpose, according to the invention, not only is the region or hemisphere in front of the airplane covered by the firing apparatus secured to the avion, as in the known apparatus, but the region or hemisphere in the rear is covered, according to the same principle, by firing apparatus which are also secured to the avion, and the gunner can employ controls which enable him to act upon the whole of the control surfaces of the avion, both vertically and laterally, in such way that he can direct his fire by directing the avion himself.

In the accompanying drawing, which is given by way of example:

Fig. 1 is a diagrammatic side view of a fighter plane according to the invention.

Fig. 2 is a corresponding plan view.

Fig. 3 shows a detail in plan view, indicating diagrammatically and by way of example, a constructional form of the control lines.

Fig. 4 is a like view, in perspective.

In the example shown in the drawing, the airplane comprises arms **1** directed towards the front, which are secured to the airplane in such way as to form part of the same, these being controlled by the pilot who occupies the seat **2**. The pilot controls the airplane by the usual means, i. e., the control stick **3** and the single-tree **4**. The control stick acts upon the elevators **5** by cables **6**, and the single-tree **4** acts upon the rudders **8** by cables **9**.

According to the invention, the arms **10** (machine guns, cannon, etc.) used by the gunner, who occupies the seat **12** turned towards the rear, are secured in place on the airplane, as well as the arms **1**. The gunner can operate control lines by which he can act upon the control surfaces of the avion, like the pilot. These control lines are represented diagrammatically in the drawing by the control stick **3'** and the single-tree **4'**. As shown in Fig. 4, the stick **3'** is connected by levers **14** to the cables **6** which actuate the elevators, and the single-tree **4'** is connected by cables **9'** to the cables **9** leading to the rudders.

In these conditions, if an enemy plane comes into the rear region, the gunner will direct his fire, not by directing his arms as in the known apparatus, but by acting upon the airplane control lines in such way as to place the rear part of the avion in the desired direction, both vertically and laterally.

As will be understood, the rear stand is not a piloting stand properly so called, but it only serves to allow the gunner to give the rear part of the avion the desired firing position.

A signal device of any kind may be employed, in order that the gunner may advise the pilot that he is to act upon the control surfaces.

It is also feasible to provide a device for uncoupling the control lines, in order that the lines actuated by the pilot and the lines actuated by the gunner shall be entirely independent.

A fighter plane thus arranged has great advantages. The firing apparatus can be readily and rapidly mounted and replaced. The apparatus offers less resistance to flight, and it is finer and is more available as to space occupied.

The construction shown in the drawing is obviously given solely by way of example. The arms at the front and rear may be secured to the wings, in the fuselage, or in the rear of the engine nacelles. If necessary, they may be pointed permanently in any direction.

The control lines actuated by the gunner may obviously be placed in such manner that the movements which effects in order to direct the rear end of the avion shall be exactly the same as the movements effected by the pilot in order to direct the front part.

The invention is applicable to multi-seaters of all types.

RENÉ FONCK.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. FONCK
FIGHTER PLANES
Filed Jan. 9, 1941

Serial No.
373,714

Fig.1

Fig.2

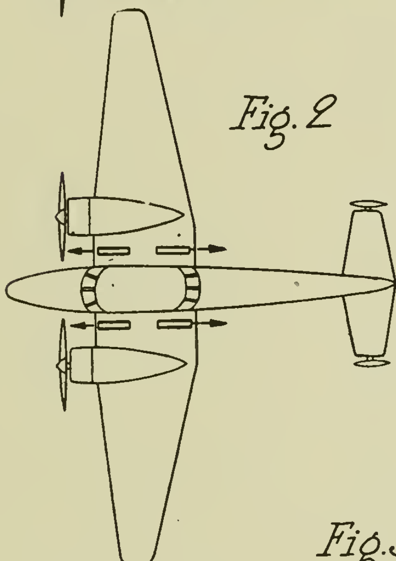


Fig.3

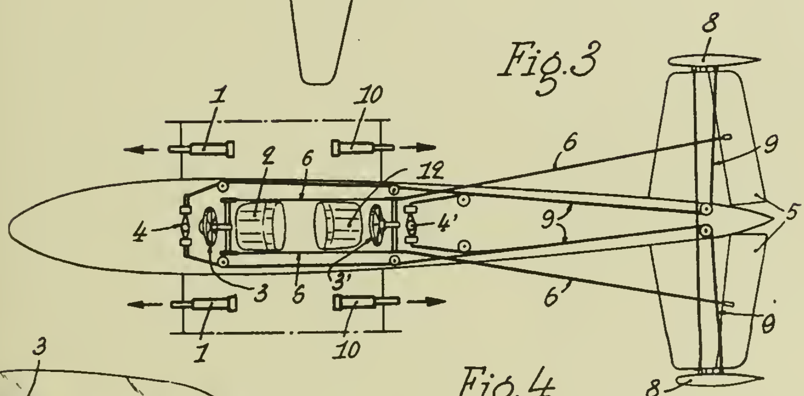
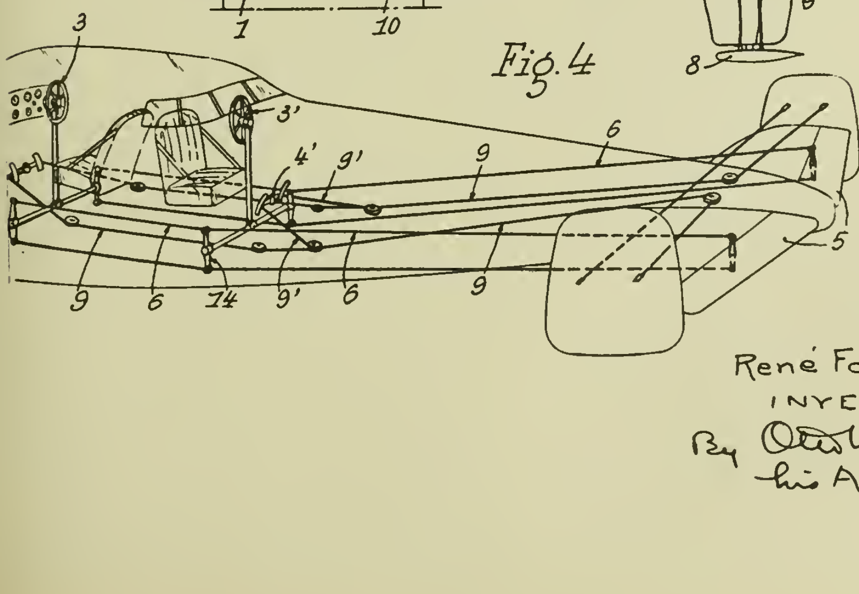


Fig.4



René Fonck
INVENTOR
By [illegible]
his ATTY.

Published May 25, 1943

Serial No. 373,942

ALIEN PROPERTY CUSTODIAN

ART OF CARRYING OUT EXOTHERMIC REACTIONS

Wilhelm Wenzel, Leuna, Germany; vested in the Alien Property Custodian

No Drawing. Application filed January 10, 1941

The present invention relates to the art of carrying out exothermic reactions in the gaseous or vaporous phase.

In exothermic catalytic reactions it is often very important to carry away the heat of reaction formed as quickly as possible; in particular when the reaction is carried out in the presence of a catalyst an even small increase of the temperature beyond the desired height may affect the activity of the catalyst or may cause undesired side reactions.

An example of such reactions is the conversion of carbon monoxide with hydrogen to form hydrocarbons containing more than one carbon atom in the molecule. Several proposals have already been made for carrying away the excess of heat evolved during this reaction, for example by indirect heat exchange relation with vaporizing water surrounding the catalyst space or by passing the reaction gases so rapidly through the catalyst space that the heat evolved is carried away by the gases and cooling the gases before they enter again the catalyst space, or by carrying out the conversion in the liquid phase, preferably in the so-called proper oil, i. e. a portion of the liquid products formed in the reaction, or also by rinsing the catalyst with a liquid medium, if desired while simultaneously cooling the reaction space by indirect heat exchange relation. These operations may be carried into effect on a technical scale, but nevertheless their applicability is restricted. When carrying out the conversion while cooling by indirect heat exchange relation with a cooling liquid or while working in the liquid phase, the velocity of flow of the gases cannot be increased beyond a definite value, and when carrying away the heat by rapidly passing the gases through the catalyst space, the catalyst layers cannot be chosen too high, if the recycling of the gases shall not require too much energy.

It has also been proposed to render the cooling of the gases more effective by increasing their capacity of taking up heat by the addition of suitable substances, as for example by adding hydrocarbon vapors. However, the effect attained in this manner in respect of the maintenance of constant temperatures is only small.

I have now found that with exothermic catalytic reactions effected in the gaseous or vaporous phase, an increase of the temperature beyond the desired height may be avoided by introducing into the catalyst space during the conversion, preferably in a finely dispersed state, a liquid, the boiling point of which, under the pressure of the gases or vapors prevailing in the reaction space, is lower than the temperature to be attained by this cooling step, and which liquid has been preheated to this boiling point or to a higher temperature. The said liquid may also be supplied in admixture with other liquids which have a higher boiling point and remain liquid also after the introduction into the catalyst space. Examples of such liquid mixtures are in particular hydrocarbon oils of which only a lower boiling fraction is vaporized in the catalyst space. In this manner any overheating may be avoided even in large catalyst spaces.

Further cooling means, as for example indirect heat exchange relation through the walls of the catalyst space or rapid recycling of the gases with intermediate cooling, are not necessary when operating in the said manner. However, if for any reason it is desired to supply only small amounts of liquid, for example in order to keep the amount of the added liquid in the gases or vapors only low, also further cooling means may be provided.

The said cooling operation may be employed for very different exothermic catalytic reactions, for example for the preparation of oxygen-containing organic compounds, in particular alcohols, from carbon monoxide and hydrogen and especially for the hydrocarbon synthesis from carbon monoxide and hydrogen. The cooling effect attained by the added liquid is the greater the larger is the amount of liquid with reference to the amount of gas. When carrying out strongly exothermic reactions, as for example the synthesis of hydrocarbons from carbon monoxide and hydrogen, the finely dispersed liquid is preferably added already into the first part of the catalyst space, where usually the largest amount of heat is evolved. The fine dispersion of the added liquid effects an instantaneous vaporization of the small liquid particles or a disruption thereof, if they contain higher boiling portions. The step of preheating the liquids before adding them into the reaction space is an essential feature of my present process, which involves particular advantages over the addition of liquids not having been preheated. This preheating step has the effect that the liquid particles are vaporized or disrupted instantaneously after their introduction into the catalyst space, in particular when the liquid is present in the form of a fine dispersion. This causes a very rapid cooling of the entire reaction space without single places thereof being cooled too strongly, as may occur

when adding liquids which have not been previously heated. The suitability of the said preheated liquids for the purpose in consideration is obviously very surprising, since it should have been expected that the step of preheating the cooling liquids before their introduction is disadvantageous and counteracts the desired cooling effect. But this is not the case apparently due to the fact that the heat necessary for vaporizing the liquids is considerable, especially with water.

Very different cooling liquids may be employed which are suitably selected according to the nature of the gases or vapors to be cooled. For example, when reacting gases or vapors free from oxygen, liquid hydrocarbons or liquid oxygen-containing organic compounds, such as for example alcohols, or mixtures of the said liquids, are useful. In some cases water or mixtures of water with other liquids may be employed. In many cases the liquids formed in the reaction itself or portions thereof may be added. The degree of the cooling effect may be regulated according to desire by varying the amount of the added liquid.

The cooling liquid added need not be liquid under ordinary conditions, but also normally solid substances come into consideration if they are liquid after preheating and are vaporized at least partly, under the conditions of the reaction as is the case for example with naphthalene.

Even such liquids may be employed as undergo a chemical change during their passage through the catalyst space, as for example by hydrogenation, splitting (cracking) or polymerization. Thus strongly unsaturated compounds may be introduced which in the presence of hydrogen are converted into less strongly unsaturated compounds; again, oxygen-containing compounds may be added which in the course of the reaction are reduced to a higher or lower degree.

As mixtures of liquids inhomogeneous mixtures, as for example mixtures of liquid hydrocarbons and water, also come into consideration.

The liquid is advantageously introduced directly before the catalyst, but the addition and the dispersion may also be effected at some distance from the catalyst layer if it is secured that a substantial part of the liquid is evaporated not before the catalyst layer, so that the desired cooling effect extends over the whole layer of the catalyst. The fine dispersion of the liquid is preferably produced by introducing the liquid through fine nozzles, but also other devices, such as for example porous plates, through which the liquid is pressed, may be employed.

In many cases it may be desirable to supply the liquid at several places into the catalyst space, as for example at intervals following one another in the direction of the gas stream. This modification of the process is especially advantageous if the gases are passed through high catalyst layers.

If the conversion is effected in several stages, the liquid may be added to each stage or also to only one or several stages. The supply to the first stage is especially useful, since generally in this stage the largest amount of heat is evolved.

It has already been proposed to cool hot gases, which are subjected to exothermic reactions in several stages, after their issue from the single stages by the addition of preheated liquids being evaporated in the said gases. However, in this operation the gases are only cooled in the intermediate spaces between the single conversion stages, whereas in the present process the cooling is effected mainly in the catalyst space, i. e. during the conversion itself.

The following example will further illustrate the nature of the present invention, but the invention is not restricted to this example.

Example

A catalyst essentially comprising iron which is suitable for the synthesis of hydrocarbons from carbon monoxide and hydrogen is filled into the tubes of a tubular furnace. Thereupon, a mixture of carbon monoxide and hydrogen is passed through these tubes (which are surrounded by a vaporising cooling liquid) at 280° C., under a pressure of 20 atmospheres and with a velocity of flow of 1000 volumes per volume of catalyst and per hour. Part of the liquid hydrocarbons formed in this treatment is introduced, after compressing to 40 atmospheres and heating to 320° C., into the catalyst space through nozzles arranged above this space. In this manner it is attained that the temperature in the catalyst space does not rise beyond 285° C. Even after working for months the catalyst does not show any deposition of carbon or reduction of its activity.

When, however, the operation is effected without the addition of preheated liquid hydrocarbons, the catalyst becomes inactive after 20 days under the same conditions of temperature and pressure, even when employing a velocity of flow of only 600 volumes of gas per volume of catalyst and per hour, since carbon is deposited on the catalyst by reason of local overheating. The yield of liquid hydrocarbons reckoned on the amount of gas supplied is not greater in this case than when carrying out the conversion with an addition of preheated liquids.

WILHELM WENZEL.

Published May 25, 1943 Serial No. 373,942

ALIEN PROPERTY CUSTODIAN

ART OF CARRYING OUT EXOTHERMIC REACTIONS

Wilhelm Wenzel, Leuna, Germany; vested in the

Alien Property Custodian

No Drawing. Application filed January 10, 1941

The present invention relates to the art of carrying out exothermic reactions in the gaseous or vaporous phase.

In exothermic catalytic reactions it is often very important to carry away the heat of reaction formed as quickly as possible; in particular when the reaction is carried out in the presence of a catalyst an even small increase of the temperature beyond the desired height may affect the activity of the catalyst or may cause undesired side reactions.

An example of such reactions is the conversion of carbon monoxide with hydrogen to form hydrocarbons containing more than one carbon atom in the molecule. Several proposals have already been made for carrying away the excess of heat evolved during this reaction, for example by indirect heat exchange relation with vaporizing water surrounding the catalyst space or by passing the reaction gases so rapidly through the catalyst space that the heat evolved is carried away by the gases and cooling the gases before they enter again the catalyst space, or by carrying out the conversion in the liquid phase, preferably in the so-called proper oil, i. e. a portion of the liquid products formed in the reaction, or also by rinsing the catalyst with a liquid medium, if desired while simultaneously cooling the reaction space by indirect heat exchange relation. These operations may be carried into effect on a technical scale, but nevertheless their applicability is restricted. When carrying out the conversion while cooling by indirect heat exchange relation with a cooling liquid or while working in the liquid phase, the velocity of flow of the gases cannot be increased beyond a definite value, and when carrying away the heat by rapidly passing the gases through the catalyst space, the catalyst layers cannot be chosen too high, if the recycling of the gases shall not require too much energy.

It has also been proposed to render the cooling of the gases more effective by increasing their capacity of taking up heat by the addition of suitable substances, as for example by adding hydrocarbon vapors. However, the effect attained in this manner in respect of the maintenance of constant temperatures is only small.

I have now found that with exothermic catalytic reactions effected in the gaseous or vaporous phase, an increase of the temperature beyond the desired height may be avoided by introducing into the catalyst space during the conversion, preferably in a finely dispersed state, a liquid, the boiling point of which, under the pressure of the gases or vapors prevailing in the reaction space, is lower than the temperature to be attained by this cooling step, and which liquid has been preheated to this boiling point or to a higher temperature. The said liquid may also be supplied in admixture with other liquids which have a higher boiling point and remain liquid also after the introduction into the catalyst space. Examples of such liquid mixtures are in particular hydrocarbon oils of which only a lower boiling fraction is vaporized in the catalyst space. In this manner any overheating may be avoided even in large catalyst spaces.

Further cooling means, as for example indirect heat exchange relation through the walls of the catalyst space or rapid recycling of the gases with intermediate cooling, are not necessary when operating in the said manner. However, if for any reason it is desired to supply only small amounts of liquid, for example in order to keep the amount of the added liquid in the gases or vapors only low, also further cooling means may be provided.

The said cooling operation may be employed for very different exothermic catalytic reactions, for example for the preparation of oxygen-containing organic compounds, in particular alcohols, from carbon monoxide and hydrogen and especially for the hydrocarbon synthesis from carbon monoxide and hydrogen. The cooling effect attained by the added liquid is the greater the larger is the amount of liquid with reference to the amount of gas. When carrying out strongly exothermic reactions, as for example the synthesis of hydrocarbons from carbon monoxide and hydrogen, the finely dispersed liquid is preferably added already into the first part of the catalyst space, where usually the largest amount of heat is evolved. The fine dispersion of the added liquid effects an instantaneous vaporization of the small liquid particles or a disruption thereof, if they contain higher boiling portions. The step of preheating the liquids before adding them into the reaction space is an essential feature of my present process, which involves particular advantages over the addition of liquids not having been preheated. This preheating step has the effect that the liquid particles are vaporized or disrupted instantaneously after their introduction into the catalyst space, in particular when the liquid is present in the form of a fine dispersion. This causes a very rapid cooling of the entire reaction space without single places thereof being cooled too strongly, as may occur

when adding liquids which have not been previously heated. The suitability of the said preheated liquids for the purpose in consideration is obviously very surprising, since it should have been expected that the step of preheating the cooling liquids before their introduction is disadvantageous and counteracts the desired cooling effect. But this is not the case apparently due to the fact that the heat necessary for vaporizing the liquids is considerable, especially with water.

Very different cooling liquids may be employed which are suitably selected according to the nature of the gases or vapors to be cooled. For example, when reacting gases or vapors free from oxygen, liquid hydrocarbons or liquid oxygen-containing organic compounds, such as for example alcohols, or mixtures of the said liquids, are useful. In some cases water or mixtures of water with other liquids may be employed. In many cases the liquids formed in the reaction itself or portions thereof may be added. The degree of the cooling effect may be regulated according to desire by varying the amount of the added liquid.

The cooling liquid added need not be liquid under ordinary conditions, but also normally solid substances come into consideration if they are liquid after preheating and are vaporized at least partly, under the conditions of the reaction as is the case for example with naphthalene.

Even such liquids may be employed as undergo a chemical change during their passage through the catalyst space, as for example by hydrogenation, splitting (cracking) or polymerization. Thus strongly unsaturated compounds may be introduced which in the presence of hydrogen are converted into less strongly unsaturated compounds; again, oxygen-containing compounds may be added which in the course of the reaction are reduced to a higher or lower degree.

As mixtures of liquids inhomogeneous mixtures, as for example mixtures of liquid hydrocarbons and water, also come into consideration.

The liquid is advantageously introduced directly before the catalyst, but the addition and the dispersion may also be effected at some distance from the catalyst layer if it is secured that a substantial part of the liquid is evaporated not before the catalyst layer, so that the desired cooling effect extends over the whole layer of the catalyst. The fine dispersion of the liquid is preferably produced by introducing the liquid through fine nozzles, but also other devices, such as for example porous plates, through which the liquid is pressed, may be employed.

In many cases it may be desirable to supply the liquid at several places into the catalyst space, as for example at intervals following one another in the direction of the gas stream. This modification of the process is especially advantageous if the gases are passed through high catalyst layers.

If the conversion is effected in several stages, the liquid may be added to each stage or also to only one or several stages. The supply to the first stage is especially useful, since generally in this stage the largest amount of heat is evolved.

It has already been proposed to cool hot gases, which are subjected to exothermic reactions in several stages, after their issue from the single stages by the addition of preheated liquids being evaporated in the said gases. However, in this operation the gases are only cooled in the intermediate spaces between the single conversion stages, whereas in the present process the cooling is effected mainly in the catalyst space, i. e. during the conversion itself.

The following example will further illustrate the nature of the present invention, but the invention is not restricted to this example.

Example

A catalyst essentially comprising iron which is suitable for the synthesis of hydrocarbons from carbon monoxide and hydrogen is filled into the tubes of a tubular furnace. Thereupon, a mixture of carbon monoxide and hydrogen is passed through these tubes (which are surrounded by a vaporising cooling liquid) at 280° C., under a pressure of 20 atmospheres and with a velocity of flow of 1000 volumes per volume of catalyst and per hour. Part of the liquid hydrocarbons formed in this treatment is introduced, after compressing to 40 atmospheres and heating to 320° C., into the catalyst space through nozzles arranged above this space. In this manner it is attained that the temperature in the catalyst space does not rise beyond 285° C. Even after working for months the catalyst does not show any deposition of carbon or reduction of its activity.

When, however, the operation is effected without the addition of preheated liquid hydrocarbons, the catalyst becomes inactive after 20 days under the same conditions of temperature and pressure, even when employing a velocity of flow of only 600 volumes of gas per volume of catalyst and per hour, since carbon is deposited on the catalyst by reason of local overheating. The yield of liquid hydrocarbons reckoned on the amount of gas supplied is not greater in this case than when carrying out the conversion with an addition of preheated liquids.

WILHELM WENZEL.

Published May 25, 1943

Serial No. 373,996

ALIEN PROPERTY CUSTODIAN

DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES

Robert Anschütz and Ernst Hugo Kämmel, Zella-Mehlis, Germany; vested in the Alien Property Custodian

Application filed January 10, 1941

This invention relates to a device applicable for bookkeeping-calculating and similar machines, especially for typewriting-calculating machines equipped with total-taking mechanism in which a stationary camshaft is used as selecting member for the types to be printed and the control of the type touch is effected by camshaft controlled setting members of a swing frame driven by a member of the total-taking mechanism.

With known machines of this kind, when recording the total from a column totalizer, by the automatic total-taking device, the respective number of zeros was printed, corresponding to the difference of the calculating places of that respective column totalizer and the recorded total. This, however, in many cases was not desirable.

This disadvantage is removed, according to the invention, by a device put into operation by the total-taking control member and put out of operation by the camshaft, thus preventing the printing of zeros in front of integers.

The invention will be better understood by reference to the following detailed description in connection with the accompanying drawings showing by way of example and schematically two embodiments of the invention, viz:—

Fig. 1 is a left side-view of a typewriting-calculating machine equipped with the device according to the invention.

Fig. 2 shows a perspective view of different control members shown in Fig. 1, viewed from left front of the machine, and in which for better illustration some parts have been drawn out telescope fashion.

Fig. 3 shows a left side view of the typewriting-calculating machine with further parts belonging to the invention and showing the parts in their rest position.

Fig. 4 shows a perspective view from left front of several control members and in which for better illustration some of these have been drawn out telescope fashion.

Fig. 5 shows a left side view of various gear parts of Fig. 3, said parts being shown in their operative position.

Fig. 6 shows a left side view according to Fig. 5, some parts already having resumed their rest position.

Figures 7–12 show another form of the invention, viz:—

Fig. 7 shows a left side view of a typewriting-calculating machine with the novel device in rest position.

Fig. 8 shows a view according to Fig. 7 upon an enlarged scale, the machine frame and various parts being shown incomplete.

Fig. 9 shows a plan view of the coupling device as seen from left front of the machine.

Fig. 10 shows a perspective view of various gear parts pertaining to the invention and shown in Fig. 7.

Fig. 11 shows a left view of the gear parts, according to the inventions, upon an enlarged scale.

Fig. 12 shows a left view of various single gear parts of Fig. 11 in operating position.

General description of the machine

The machine consists principally of a machine frame **1** (Figs. 1 and 3) carrying the typing mechanism, a paper carriage **2** which is mounted to slide on the carriage sliding rails **3** and **4** fastened on the machine frame **1**, and of the column- or idle totalizers **6** respectively which can be put on and removed from the totalizer suspension rail **5**. The machine is also equipped with a calculating mechanism **7** fastened to the front side of the machine, as well as with a keyboard **8** for typing and a keyboard **9** of a decimal tabulator.

A supporting frame **10** forms another part of the machine in which a calculating keyboard **11** (Fig. 1) with its curved elements and a total taking key **12** with its respective curved elements **13** and **14** (Fig. 3) are provided. A motor, not shown, is mounted at the right side of the machine frame **1** and by means of gears drives the calculating mechanism, the respective parts of the total-taking key as well as the typing mechanism.

The following description explains two forms of the invention:

Description of the single parts of the first form of the invention

A total taking lever **16** is mounted to move on the shaft **15** which is fastened to the frame **10** (Figs. 1 to 5). Said lever **16** is pressed in its rest position against a locking bar **20** by means of a spring **19** which is fastened at one end to the arm **17** and with the other end to the spring suspension bar **18**. A locking lever **22** which is mounted to swing at the total taking lever **16** by means of a headed screw **21** is pressed against the locking bar **20** fastened to the frame **10** by means of the spring **23** and the extension **24**. The projection **25** of the locking lever **22** is cooperating with a releasing member, not shown, which releases the locking position of the total taking lever **16**. Another lever **26** which is also mounted to swing on shaft **15** is pressed in its

rest position against a flat 28 of the locking bar 20 by means of a spring 27. The lever engages with a roller 29 fastened to the cam 13. The cam 13 is rigidly connected with the cam 14. A coupling pawl 31 which is mounted to slide on the cams 13 and 14 by means of rivet 30 is pressed against the arm 33 of a lever 34 by means of a spring 32 (Fig. 3). Said arm 33 is likewise mounted on the shaft 15, whereby the coupling pawl 31 is held inoperative with relation to the coupling wheel 36 rigidly mounted on the shaft 35. The cams 13 and 14 are thus made to revolve by means of the spring 32 and the roller 29 of the cam 15 is forced against a stop surface 37 of the lever 26, thus holding the cams 13 and 14 in rest position, as shown in Fig. 1.

The lever 34 is turned anti-clockwise by means of a spring 40 which is attached at one end to said lever 34 and at the other end to a bolt 38 (Fig. 1) fastened to a member 39 of the machine, its normal position being fixed by the lug 41, which is attached to the lever 34, striking against the edge 42 of the total taking lever 16.

A rod 43 (Figs. 1 to 6) is jointed to the downward pointing arm of the total taking lever 16 by means of a screw bolt 44. Said rod 43 is guided laterally by a guide member 46 fastened to the frame 10 by means of bolts 45 (Figs. 4, 5, 6) and vertically by a slot in a guide member 45*b* fastened to the frame 10 by means of bolts 45*a*. A two-arm lever 47 is mounted to swing on the rearward pointing end of the rod 43 by means of a headed screw 48.

A bent lug 51 at the two-arm lever 47 (Fig. 5) cooperates with the rod 43 in a certain manner to be described later. Said two-arm lever 47 is turned anti-clockwise around the pivot 48 by means of a spring 52 which at one end is connected to the lever 47 and at the other end is fastened to the rod 43, the normal position of the two-arm lever 47 being fixed by the lug 51 striking against the edge 53 of the rod 43.

A rod 55 is jointed to the downward pointing arm of the two-arm lever 47 by means of a headed screw 54. Said rod 55 is mounted to slide on the rod 43 by means of a headed screw 56 protruding through an open longitudinal slot 57 of the rod 55 and being bolted to the rod 43. The upper leg 58 of the rod 55, as shown in Fig. 4, cooperates with a two arm lever 59 to be described later in a certain manner which is explained under the heading "Operation of the first form of the invention."

A further slide 62 is mounted to slide on the slide 55 by means of a headed screw 60 protruding through a slot 61 of the slide 55. A member 64 is screwed to the slide 62 by means of the screws 63 (Figs. 1, 3 and 4). The member 64 and the slide 62 are provided with recesses so as to form a longitudinal slot 65 through which a shaft 66 is protruding which rests in the two sides of the frame 10 and serves as a guide for the two coherent members 62 and 64. The slide consisting of the members 62 and 64 has been designed in two parts for reasons of better assembly. The free forward-pointing end of the member 64 of the slide 62 is prevented from sliding laterally by the guide member 67 fastened to an intermediary wall of the frame 10. A spring 68 which at one side catches at a pin 69 fixed in the slide 62 and at the other side is attached to the guide member 45*b* (Fig. 5) fixed to the frame 10, tends to move the slide 62, 64 in the direction of arrow 70, its normal position being determined by the headed screw 60 striking against the edge 71 of the slot 61 of the slide 55 (Fig. 4).

A shaft 72 (Figs. 1, 2 and 3) is mounted to revolve in the two side parts of the frame 10 and a two-arm lever 73 (Figs. 2 and 5) is mounted so as to turn but not to slide on said shaft. The forward pointing arm of the two-arm lever 73 is bent upwards and cooperates with a sleeve 75 mounted on a bar 74 of a switch bridge. This bridge which is described in detail in the patent ——— (patent application Ser. No. 146,897, Anschütz) under reference numerals 377, 378, 379, 376, is not an object of this invention. Said switch bridge causes the carriage to move when the cam 15 engages the roller 145. A lug 76 (Figs. 1, 3 and 6) which is bent on the two-arm lever 73 towards left (shown in Fig. 4) cooperates with the downward pointed arm of the two-arm lever 59. The two-arm lever 59 is mounted to swing around a headed screw 78 fastened in the supporting member 77. The headed screw 78 protrudes through a longitudinal slot 79 (Fig. 4) of the two-arm lever 59. The supporting member 77 designed as shown in Fig. 4 is fastened to the back wall of the frame 1 by means of the screw 80 (Figs. 1 and 3). Owing to the screw-slot-connection 78, 79, the two-arm lever 59 is made to swing as well as slide up and down. The spring 83 which catches on the lever 59 and is suspended on a pin 82 of the supporting member 77 tends to move the two-arm lever 59 downwards, its normal position being determined by the upper edge of the slot 79 striking against the headed screw 78. The rotation caused by the spring 83 is limited by the upwards pointing arm of the two-arm lever 59 striking against the left end of a longitudinal slot 85 of the supporting member 77 (Fig. 4). The two-arm lever 59 is guided with its upward pointed arm in the longitudinal slot 85 of the supporting member 77 and cooperates with a lever 87 which is mounted to slide by means of a pivot 86.

The free end of the lever 87 with its open slot 88 embraces a pin 89 of a lever 90 which is rigidly mounted on the supporting shaft 92. The shaft 92 is fixedly arranged in the frame, not shown, carrying the type levers 91. The lever 90 is connected with the universal U-member 96, as commonly used in typewriting machines, by means of a system of levers 93 to 95 (Fig. 1).

A shaft 99 is mounted to revolve but not to slide in the two bearings 98 which are fastened to the back wall of the machine frame 1 by means of screws 97 (Figs. 1, 3 and 4). A lever 100 is rigidly mounted at the right end of the shaft 99 (Fig. 4) while another lever 101 is rigidly mounted at the left end of said shaft 99. The free end of the lever 101 has a nose 102 which cooperates with a catch 104 rigidly mounted on the camshaft 103. This camshaft 103 is mounted to revolve in a U-shaped bearing 106 which is fastened to the frame 1 by means of screws 105 (Fig. 1). Said camshaft 103 is described in detail in the Patent ——— (patent application Ser. No. 146,897, Anschütz) under reference numeral 299 and therefore needs no further explanation. The free end of the lever 100 has a right-bent lug 107 (Fig. 4) cooperating with the two-arm lever 47. The lever 100, the shaft 99 and the lever 101 are moved anti-clockwise by means of a spring 108 which at one end catches on the lever 100 and at the other end is suspended from a pin 109 (Fig. 3) of the supporting member 46. The normal position of the lever 100, the shaft 99 and the lever 101 is determined

by the pin 110 which is fastened to the lever 101, striking against the supporting member 106 (Fig. 3).

Typing operation during the total taking

Before explaining the operation of the invention proper it is intended for better understanding to describe the typing operation as far as it is connected with the invention, said operation being described in detail in the patent ——— (patent applieation Ser. No. 146,897, Anschütz).

After releasing the slide 111 mounted in the calculating meehanism 7 (Figs. 1 to 3) by means of the camshaft 14, the same is moved downwards by the action of the springs 112 connected to it. Simultaneously the releasing slide 111 by means of its pin 113 acts upon the lug 114 (Figs. 3, 4 and 5) of a lever 115 moving the latter clockwise around the pivot 116. The angle lever 117 is likewise moved elockwise around its pivot 119 by means of the spring 118 fastened on one end to the lever 115 and at the other end to said angle lever 117. Simultaneously the angle lever 117 acts with the edge 142 of its upward pointed arm upon the curve 120 of a slide 121, moving the same against the action of the spring 122 (Fig. 4) in the direction of the arrow 70. Consequently the lug 123 of the slide 121 engages in the slot 124 of a lever 125, thereby making the driving connection between the lever 125 and the lever 126 of a swing frame which is designated with the numerals 319, 327, 317 in Patent ——— (patent application Ser. No. 146,897, Anschütz). As soon as the camshaft 13 acts upon the lever 133, said lever 133 is moved clockwise around its pivot 135 against the action of spring 134, whereby the swing frame is operated through the lever 125 and the driving connection 123, 124 and the typing operation is put in force.

Operation of the first form of the invention

If it is intended to print a value from one of the totalizers 6 by means of the automatic total-taking mechanism, the respective totalizer 6 is brought into operating position with its highest denomination or calculating plaee by depressing, for instance, the corresponding tabulator key. It may be assumed that several zeros are placed in front of a complete figure in the totalizer. Now, the total-taking key 12 (Figs. 1, 2) is depressed, causing the total-taking key lever 16 to be moved clockwise around its pivot 15 against the spring 19 and also taking along the locking lever 22. The latter with its arm 24 slides off the locking bar 20, is moved clockwise around the pivot 21 by the spring 23 and finally eatches in a notch 126 (Fig. 2) of the locking bar 20. Consequently, the total-taking key lever 16 and the locking bar 22 are kept in their operating position. The arm 25 of the locking bar 22 is thus placed in operating position towards a releasing member, not shown, which liberates the total taking key lever 16.

While being moved, the total-taking key lever 16 acts with its edge 42 upon the lug 41 of the coupling lever 34 and moves the latter clockwise around the pivot 15. The eoupling lever 34 now releases the nose 129 of the coupling pawl 31 so that the latter is moved against the coupling wheel 36 by its spring 32 and with its nose 130 engages with the coupling wheel 36. Consequently, the camshafts 13 and 14 are coupled with the shaft 35 which is constantly revolved by the motor. Whilst the total-taking key lever 16 is moved, the slide 43 being jointed to same is moved against the direction of the arrow 370. Whilst the slide 43 is moved, its edge 53 (Fig. 5) acts upon the lug 51 of the two-arm lever 47, moving the latter clockwise against the spring 52 around the pivot formed by the upward pointed arm of the two-arm lever 47. Simultaneously, the slide 55 jointed to the downward pointed arm of the two-arm lever 47 is moved against the direction of arrow 70 and with its part 58 moves the two-arm lever 59 around the pivot 78 clockwise against the spring 83 (Fig. 3). The two-arm lever 59 during this swing movement at one end with its upward pointing arm is brought into operating position towards the lever 87 and at the other end with its downwards pointing arm is brough into the path of the lug 76 of the two-arm lever 173.

During the movement of the slide 55 in the opposite direction of the arrow 70, the slide 62, 64 is likewise moved around the pivot 60 in the opposite direction of the arrow 70 and the recess 131 of the slide 62, 64 embraces the lug 132 of the angle lever 177.

Now the releasing slide 111 with its pin 113 acts upon the lug 114 of the lever 115, as described under the heading "Typing during the total-taking operation," said releasing slide 111 being moved clockwise around the pivot 116 and against the spring 118. Owing to the locking device 131, 132, the angle lever 117 cannot take part in the movement of the lever 115 and the driving eonnection 123, 124 (Fig. 1) cannot be established, but only the spring 118 is contracted. If the lever 133 (Figs. 1 to 4) is moved clockwise around its pivot 135 against the spring 134 by means of the cam 13, the lever 125 which is jointed to the lever 133 is moved downwards and the nose 146 of the lever 125 does not engage the lug 123 of the slide 121.

It ensures that the lever designated with the number 126 in the present application and with the number 319 in the Patent ——— (patent application, Serial No. 146,897, Anschütz) as well as the swing frame marked 319, 327, 317 in the said patent are not operated and consequently the zero in the highest calculating place of the operative totalizer 6 is not printed.

If, however, the raised part 136 (figs. 1, 2) of the cam 13 acts upon the roller 145 of the switch-bridge designated as 377, 378, 379, 376 in the Patent ——— (patent applieation, Serial Nr. 146,897, Anschütz), this will cause the carriage to move. Simultaneously, the sleeve 75 acts upon the two-arm lever 73 moving it clockwise and the lug 76 (fig. 4) of the two-arm lever acts upon the lower edge of the downwards pointing arm of the two-arm lever 59 which, as described above, at one end with its lower arm was brought into the path of the lug 76 of the two-arm lever 73 and at the other end with its upward pointed arm was brought into operative position towards the lever 87. Owing to the lug 76 of the two-arm lever 73 acting upon the two-arm lever 59, the latter is moved against the spring 83 in the direction of the arrow 81. Now, the upward pointed arm of the two-arm lever 59 acts upon the lever 87 from below, moving it anti-clockwise. Consequently, the lever 90 as well as the shaft 92 are moved clockwise by means of the pin and slot connection 89, 88. This causes the parts 93 to 96 and 137 to 139 (fig. 1) to be released one step and the totalizer to be put into operative position with its next lower position. If this position also shows zero, the same process is repeated since all parts are still in operative posi-

tion. If the totalizer 6 now reaches a decimal place in its working position, say the number 5, the camshaft 103 is correspondingly revolved during the selective typing of the value 5 from the totalizer, as described in the patent ——— (patent application Ser. Nr. 146,897, Anschütz), by means of the parts designated therein as 191, 202, 203, 208, 293, 295, 298 and shown in figs. 8 and 12. Simultaneously, the cam 104 mounted on the camshaft 103 (fig. 4) acts upon the nose 102 of the lever 101 (fig. 6) moving the latter as well as the shaft 99 and the lever 100 clockwise against the spring 108. Now the lug 107 of the lever 100 also releases the edge 140 of the two-arm lever 47 so that the latter is moved anticlockwise around the pivot 48 by the pull of the spring 52. This movement is limited by the nose 141 of the two-arm lever 47 striking against the lug 107 of the lever 100 (fig. 6).

Owing to the anti-clockwise movement of the two-arm lever 47 around the pivot 48, the slide 55 is also moved part of the way in the direction of the arrow 70. The slide 62, 64 through the action of the spring 68 can now follow the slide 55 for the same distance assuming the position shown in fig. 6 in which the recess 131 of the slide 62, 64 has released the lug 132 of the angle lever 117.

During the partial movement of the slide 55 in the direction of arrow 70, the part 58 of the slide 55 again released the two-arm lever 59, whereupon the latter returns to its rest position shown in fig. 1 by the action of spring 83, interrupting the driving connection 59, 76.

If the releasing slide 111 is now moved downwards, the angle lever 117 is moved clockwise around its pivot 119 by means of the members 113, 114, 115, 118 described under the heading "Typing during the total-taking operation". Consequently the angle lever 117 acts with its edge upon the lug 120 (fig. 4) of the slide 121, moving the same in the direction of arrow 70, whereby the driving connection 123, 124 (fig. 1) is established.

Now the cam 13 with its raised part 136 acts upon the lever 133 moving it against the spring 134 around the pivot 135. This tends to operate the driving connection 123, 124 by means of the bar 125 as well as the swing frame 126 by means of the slide 121. Said swing frame is designated in the patent —— (patent application Ser. Nr. 146897, Anschütz) with the numerals 319, 327, 317. It follows that the value "5" in the totalizer 6 will be printed. The movement of the carriage is now started by depressing the type lever 91.

The cam 13 also acts upon the roller 145, moving the shaft 74 and the sleeve 75 of the levers 73 clockwise around the pivot 72. The lug 76 of the two-arm lever 73, however, does not act upon the two-arm lever 59 owing to the interruption of the driving connection 59, 76, as already described.

After recording the last value from the operative totalizer 6, a releasing member acts upon the end of the locking bar 22, so that the total-taking key lever 16 returns to its rest position. Simultaneously the coupling lever 34 is also returned to its rest position by the spring 40. The coupling lever 34 now comes into the pathway of the nose 129 of the coupling pawl 31, whereby the cams 13 and 14 are again released by the constantly revolving shaft 15.

When the total-taking key lever 16 is moved into its rest position, the slide 43 as well as the lever 47 jointed to it are moved in the direction of arrow 70.

The lug 107 of the lever 100 thus slides along the edge 143 (fig. 3) until the latter releases the lug 107. Consequently the lever 100, the shaft 99 and the lever 101 by means of the spring 108 are returned into their rest position shown in fig. 1, in which the nose 102 of the lever 101 again comes into the path of the cam 104.

Owing to the two-arm lever 47 being moved in the direction of arrow 70, the slide 55 is also moved in the direction of arrow 70, so that the slide 62, 64 by means of the spring 68 is returned into the position shown in fig. 1.

If, for instance, a "zero" is included in a value, as in the figure "50678", this zero is printed since the device for preventing the printing of zeros in front of an integer has been made inoperative by the cam 104 acting upon the nose 102 of the lever 101, thus releasing the lock 131, 132.

Description of the single parts of the second form of the invention

As far as the parts of this form of construction correspond with the parts of the first form, the same characters of reference have been used for the former.

A lever 152 (fig. 9) has been mounted to swing but not to slide on the shaft 15 by means of the hubs 150 and 151. A spring 153 catches with one end on the lever 152 and with its other end is attached to a spring suspension bolt 154 which is riveted in the totalizer key lever 16. This spring 153 acts clockwise upon the lever 152, the rest position of the lever 152 being determined by a roller 155 mounted on same bearing against the circumference of the cam 13. The end 156 of the lever 152 has a beveled edge 157 cooperating with a front edge 158 of a two-piece thrust bar 159, 160 (fig. 8). The driving connection 157, 158 is interrupted in the rest position, as shown in fig. 7.

The two parts 159 and 160 of the thrust bar are adjustably connected by means of a screw-slot connection 162, 161. The thrust bar 159, 160 is mounted to swing as well as to slide on a shaft-end 164 by means of a longitudinal slot 163. Said shaft-end is supported in the left wall of the machine frame 1 and is guided laterally in a suitable manner. The thrust bar 159, 160 is also guided by the part 159 sliding in a guide slot, not shown, which is punched in a downward bend 165 of a guide member 166 which is fastened to the totalizing slide cam 167. The latter is fastened to a ledge 168 for the roller locking device of the key levers of a typing keyboard 8.

A spring 170 is attached at one end to a spring suspension pin 169 fastened to the ledge 168 and at the other end to a spring suspension bolt 171 mounted in the member 159 of the thrust bar 159, 160, which by means of said spring 170 constantly tends to move in the direction of arrow 81, the upper edge of the member 159 approaching the ledge 168 from below. The thrust bar 159, 160 tends to move in the direction of arrow 70 by means of a spring 173 which at one end is suspended from a pin 174 of the member 159 of the thrust bar 159, 160 and at the other end catches at the bend 165 of the member 166 mounted on the totalizing slide guide cam 167 (Fig. 9). The normal position of said thrust bar 159, 160 is determined by the rear edge of the slot 163 striking against the shaft end 164. The end of the member 160 of the thrust bar 159, 160 pointing towards left (Fig. 8) is bevelled towards left (Fig. 10)

and cooperates with the lever 176. The lever 176 is connected with the gears described in the Patent ——— (Patent application Ser. Nr. 251,257, Anschütz) which cause the printing operation during the total-taking.

A quadratic shoulder 177 which cooperates with a bend 178 (Fig. 9) of the guide member 166 is mounted on the member 159 of the thrust bar 159, 160. A slide 181, as shown in Fig. 10, is mounted to slide on the thrust bar 159, 160 by means of two-screw-slot connections 179, 180. The slide 181 with its U-shaped part 182 embraces the member 159 of the thrust bar 159, 160 and extends forward to the right of said member 159. The slide 181 tends to move in the direction of arrow 70 by means of a spring 183 which at one end catches at a bolt 184 of the slide 181 and at the other end is suspended from the bolt 171 of the thrust bar 159, 160, the normal position of the slide 181 being determined by the left ends of the slot 180 coacting with the screws 179. A rod 185 is jointed to the downward pointed arm of the total-taking key lever 16 by means of the screw 44. The rod 185 has a longitudinal slot 186 (Figs. 7, 8, 10, 11, 12) through which the shaft 66 protrudes which is mounted to revolve in the two side walls of the frame 10. A pawl 189 is attached to the arm 187 of the rod 185 by means of the screw 188. This pawl 189 by means of a nose 190 bent towards the right cooperates with a nose 191 provided on the slide 181. A spring 193 is suspended at one end from a bolt 192 of the pawl 189 and at the other end catches in a bolt riveted to the rod 195. The pawl 189 by means of this spring 193 tends to move anti-clockwise around the pivot 188, its normal position being determined by the lug 189*a* provided thereon and contacting with the edge 189*b* of the rod 185. The lower edge of a shoulder 195 is made to cooperate with a bolt 197 mounted on a three-arm lever 196.

The three-arm lever 196 is mounted to swing on the outside of the left side wall of the supporting frame by means of a headed screw 198*a*. The rearward pointing arm of the three-arm lever 196 has a nose 198 cooperating with a cam 104.

A member 200, as shown in Fig. 10, is attached to the rod 185 (Figs. 8, 10) by means of screws 199. A supporting member 202 is fastened to the left side wall of the frame 10 by means of screws 201. A lever 204 is mounted to swing on said member 202 by means of a pivot 203. The downward pointed arm of the lever 204 has a lug 205 abutted towards the right (Fig. 10) cooperating with the member 200. The upward pointed arm of the lever 204 is abutted towards the right (Fig. 10) and has an upward pointed nose 206.

A U-shaped member 207 (Figs. 8, 10) is fastened to the left side wall of the machine frame 1 by means of screws. The slide 209 is mounted to slide laterally and to swing around the headed screw 208 by means of the headed screw 208 protruding through a longitudinal slot 208*a* of a slide 209 and by means of the headed screw 210 protruding through an angular slot 211 of the slide 209. An angular member 212 is fastened to the back wall of the machine frame 1. A spring 214 is suspended from the free arm of the member 212 and with its other end catches on the slide 209. By means of this spring 214 the slide 209 tends to move clockwise around the headed screw 208, its normal position being fixed by the right edge of the level part of the angular slot 211 contacting with the headed screw 210.

The upward pointed end of the slide 209 has a lug 215 abutted towards the left (Fig. 10) which cooperates with a nose 216 of a lever 217 rigidly mounted on the shaft 92. Said shaft 92 is supported in a frame, not shown, which also carries the type levers (Fig. 7) and is connected with the universal yoke 96, commonly known with typewriting machines, by means of a system of levers 93 to 95 (Fig. 7).

An angle piece 219 (Fig. 10) is fastened to the downward pointed end of the slide 209 by means of screw bolts 218 and a shoulder 220 mounted on said angle piece 219 cooperates with the nose 206 of the lever 204.

A lever 221 (Fig. 10) is fastened to the shaft 72 which is mounted to revolve in the two side walls of the supporting frame. This lever 221 is in driving connection with the switch bridge 377, 378, 379, 376 operating the carriage feed which is described in detail in the Patent ——— (patent application, Ser. Nr. 146,897, Anschütz). The lever 221 has an upward notch 222 through which a pin 223 of a lever 224 is protruding. Said lever 224 is mounted to turn on the shaft 66. A U-shaped slide 225, as shown in Fig. 10, is fastened to the rearward pointed end of the lever 224 by means of screw bolts 226 which protrude through the longitudinal slots 227 of the slide 225, thus causing the latter to slide on the lever 224.

The downward pointed arm of the U-shaped slide 225 is provided with a slot 228 which is open at its lower end, through which pierces a pin 229 fastened to the downward pointed arm of the three-arm lever 196.

The slide 225 is held in its normal position, as shown in Figs. 8 and 10, through the members 197, 196, 229 by means of the spring 193 catching on the pawl 189 (Fig. 10), which is fixed by the right edges of the slots 227 contacting with the bolts 226.

A pawl 230 is mounted to swing on the rod 185 (Figs. 8 and 10) by means of a headed screw 231. A spring 232 catches on the horizontal arm of the pawl 230, being suspended with its other end from a pin 233 of the rod 185. This spring 232 tends to move the pawl 230 anti-clockwise around the pivot screw 231, the normal position being fixed by the upward pointed arm of the pawl 230 against the pin 197.

Operation of the second form of the invention

If it is intended to record a value from a totalizer 6 in operating position by total-taking, assuming that several zeros are preceding an integer in the totalizer, the total-taking key 12 is depressed. In this way the driving connection between the cams 13, 14 and the permanently revolving shaft 35 (Fig. 7) is established; as described under the heading "Operation of the first form of the invention."

When the total-taking key lever 16 is moved clockwise around the shaft 15, the rod 185 is turned in the opposite direction of the arrow 70. Simultaneously the member 200 mounted to the rod 185 acts upon the lug 205 (Fig. 10) of the lever 204 moving same clockwise around the screw bolt 203. Accordingly, the nose 206 of the lever 204 acts upon the nose 220 of the member 219 fastened to the lever 209, whereby the slide 209 is moved against the spring 214 around the headed screw 208 from the position shown in Fig. 7 anti-clockwise into the position shown in Fig. 11. Thereby the nose 220 of the member 219 is moved upwards and into the path of the shoulder 235 of the slide 225.

Owing to the rod 185 being moved in opposite direction of the arrow 70, the pawl 189 fastened to same is also moved in opposite direction of the arrow 70 and the lower edge of the shoulder 195 slides along the pin 197 of the three-arm lever 196 assuming the position shown in Fig. 11 with respect to said pin. When the pawl 189 is moved in the opposite direction of the arrow 70, the nose 190 of the pawl 189 acts upon the nose 191 of the slide 181 so that the latter is also moved into the position shown in Fig. 11 in the opposite direction of the arrow 70 and against the spring 183. Simultaneously the forward pointed member 236 (Fig. 10) gets outside the path of the pin 113 mounted on the releasing slide 110.

Owing to the upward pointed arm of the pawl 230 contacting with the pin 197 of the three-arm lever 196, said pawl is moved clockwise and against the spring 232 during the turning of the rod 185 around the pivot 231, assuming the position shown in Fig. 11.

If the two cams 13, 14 are now turned clockwise and the releasing slide 110 by means of the spring 112 (Fig. 2) fastened to same is sliding downwards with its roller 237 upon the descending part of the cam 14, the pin 113 of the releasing slide 110 moves ineffectively past the member 236 (Fig. 10) of the slide 181 and consequently the driving connection 158, 157 (Fig. 10) is not established. The lever 152 (Figs. 7, 8) during its operation by means of the raised part 136 of the cam 13 therefore does not effect the thrust bar 159, 160. Consequently the value recorded from the highest calculating place of the totalizer 6, in this case a zero, cannot be printed by means of the driving members described in the Patent ——— (Patent application Ser. No. 251,257, Anschütz).

If, however, the cam 13 with its raised part 136 (Fig. 1) acts upon the roller 145 (Fig. 1) the switch bridge designated in the patent ——— (Patent application Ser. No. 146,897, Anschütz) with 377, 378, 376, is operated causing the carriage feed to move. Simultaneously the shaft 72 and the lever 221 (Fig. 10) mounted on same are moved anti-clockwise. Owing to the pin-and-slot connection 223, 222, the lever 224 mounted on shaft 66 as well as the slide 225 attached to the latter are moved clockwise around the shaft 66 and the shoulder 235 of the slide 225 acts upon the shoulder 220 of the slide 209, moving the latter upwards. During this movement of the slide 209 it also acts upon the nose 216 of the lever 217 by means of its lug 215 and consequently, by means of the lever 217 the shaft 92 (Fig. 10) and the members 93 to 96 and 137 to 139 (Fig. 7) a switching or feed step is released and the totalizer 6 is brought into operative position with its next lower figuring place.

If in this place another zero is shown in the totalizer, the identical process is repeated until an integer, as for instance "5" shows up in the totalizer 6. In this place during the recording of the value "5" from the totalizer 6, the camshaft 103 (Fig. 1) is revolved in the manner described in Patent ——— (patent application, Ser. No. 146,897, Anschütz). Simultaneously the cam 104 mounted on the camshaft 103 acts upon the nose 198 of the three-arm lever 196. Consequently the three-arm lever 196 is moved anti-clockwise around the pinion 196*a* and the bolt 229 mounted on its downward pointed arm moves the slide 225 in the direction of arrow 70. During this movement of the slide 225 the shoulder 235 of said slide 225 releases the member 220 of the slide 209.

Furthermore, during the anti-clockwise movement of the three-arm lever 196 the bolt 197 attached to same acts upon the shoulder 195 of the pawl 189 from below causing the latter to be moved clockwise around the pinion 188 against the spring 193 and the nose 190 of the pawl 189 releases the nose 191 of the slide 181. The latter now tends to move in the direction of arrow 70 by means of the previously contracted spring 183 so that the left edges of the slots 180 contact with the headed screws 179 and the slide 181 resumes its original position towards the thrust bar 159, 160. Owing to the movement of the slide 181 in the direction of arrow 70, the member 236 of the slide 181 gets into the path of the pin 113 of the releasing slide 110.

Owing to the clockwise movement of the pawl 189 into the position shown in Fig. 12, the pawl 230 can swing anti-clockwise around the pinion 231 by means of the spring 232 until it strikes against the pin 194. Simultaneously the upward pointed arm of the pawl 230 comes to lie below the pin 197, whereby the members 196, 189 are kept in the position shown in Fig. 12. If the releasing slide 110 is now moved downwards by means of the spring 112 (Fig. 2) owing to its roller 237 engaging the descending part of the cam 14, the pin 113 of the releasing slide 110 will act upon the member 236 of the slide 181. It follows that the thrust bar 159, 160 is turned clockwise around the shaft-end 164 and with the edge 158 gets into the path of the nose 156 of the lever 152 (Figs. 7 to 9). If the lever 152 is now moved anti-clockwise around the shaft 15 by means of the raised part 136 of the cam 13 acting upon the roller 155 of the lever 152, the surface 157 of the lever 152 acts upon the edge 158 of the thrust bar 159, 160 moving same in opposite direction of the arrow 70. In this way the value "5" recorded from the totalizer 6 is printed, as described in the Patent ——— (Patent application Ser. Nr. 251,257).

During the movement of the thrust bar 159, 160, the nose 177 of said thrust bar comes to lie underneath the lug 178 of the member 166 for the purpose of preventing a premature anti-clockwise movement of the thrust bar 159, 160 by means of the spring 170 (Fig. 8) after its release by the pin 113 of the releasing slide 110 and thereby to interrupt prematurely the driving connection 168, 157.

During the further turning of the cams 13 and 14 in the direction of the arrow shown in Fig. 9, the raised part 136 of the cam 13 now acts upon the roller 145 (Fig. 7), whereby the switch bridge designated with 377, 378, 379, 376 in the Patent ——— (Patent application Ser. No. 146,897, Anschütz) is operated causing the carriage feed to move. The carriage switch itself is released by striking the type lever 91 corresponding to the value "5." During the movement of the switch bridge 377, 378, 379, 376, the lever 224 and the slide 225 attached to same are moved clockwise by way of the member 221 (Fig. 10), 72, 223, 222. The shoulder 235 of the slide 225 does not act upon the shoulder 220 of the slide 209, however, since the slide 225 was put out of engagement with respect to the part 220 of the slide 209 by the anti-clockwise movement of the three-arm lever 196 around the bolt 229.

After recording or clear writing of the last value from the operative totalizer 6, a releasing member acts upon the end 25 of the locking lever

22, whereby the totalizer key lever 16 returns into its rest position. Consequently the rod 185 is returned into its rest position (Fig. 8) in the direction of arrow 70. Simultaneously the pawl 230 releases the pin 197 of the three-arm lever 196 so that the latter as well as the connected slide 225 and the pawl 189 again return to the position shown in Fig. 8, by action of the spring 193 catching on the pawl 189. During the movement of the pawl 189 from the operative position shown in Fig. 12 to the normal position shown in Fig. 8, the nose 190 of the pawl 189 again comes to lie in front of the nose 191 of the slide 181 so that all driving members resume their normal position.

ROBERT ANSCHÜTZ.
ERNST HUGO KÄMMEL.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. ANSCHÜTZ ET AL
DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING
AND SIMILAR MACHINES
Filed Jan. 10, 1941

Serial No.
373,996

11 Sheets-Sheet 1

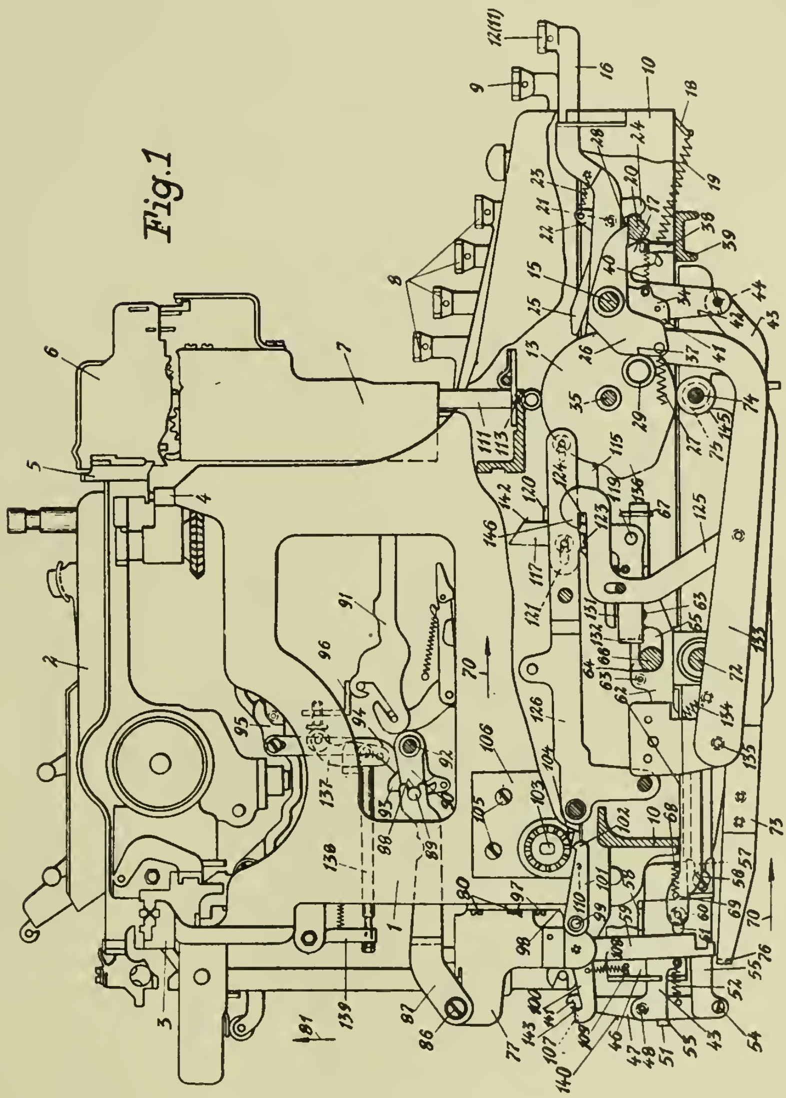


Fig. 1

Inventors,
R. Anschütz
E. H. Kämmel
By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

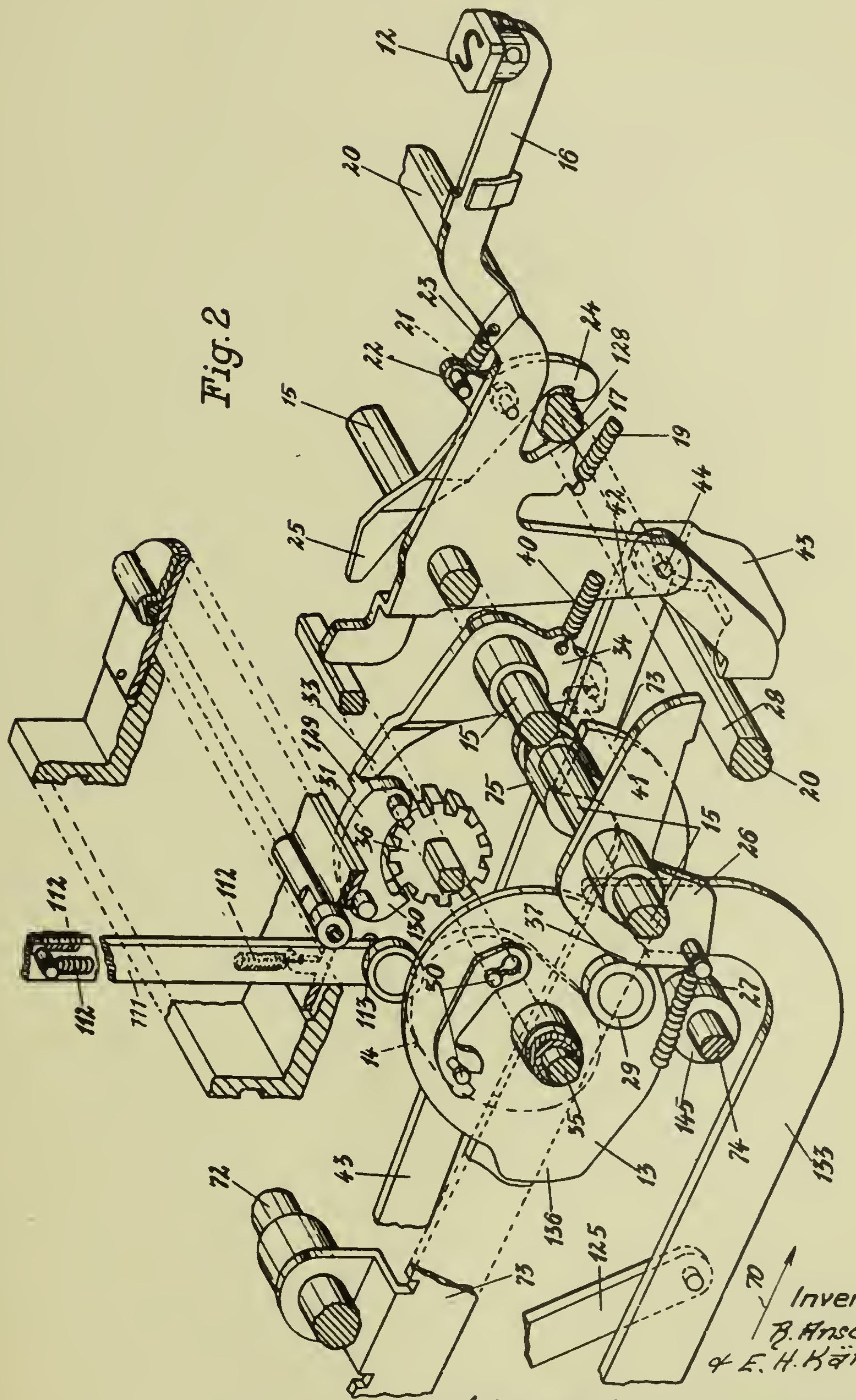
R. ANSCHÜTZ ET AL

DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES

Filed Jan. 10, 1941

Serial No. 373,996

11 Sheets-Sheet 2



Inventors,
R. Anschütz
& E. H. Kämmel

By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

R. ANSCHÜTZ ET AL
DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES
Filed Jan. 10, 1941

Serial No. 373,996
11 Sheets-Sheet 3

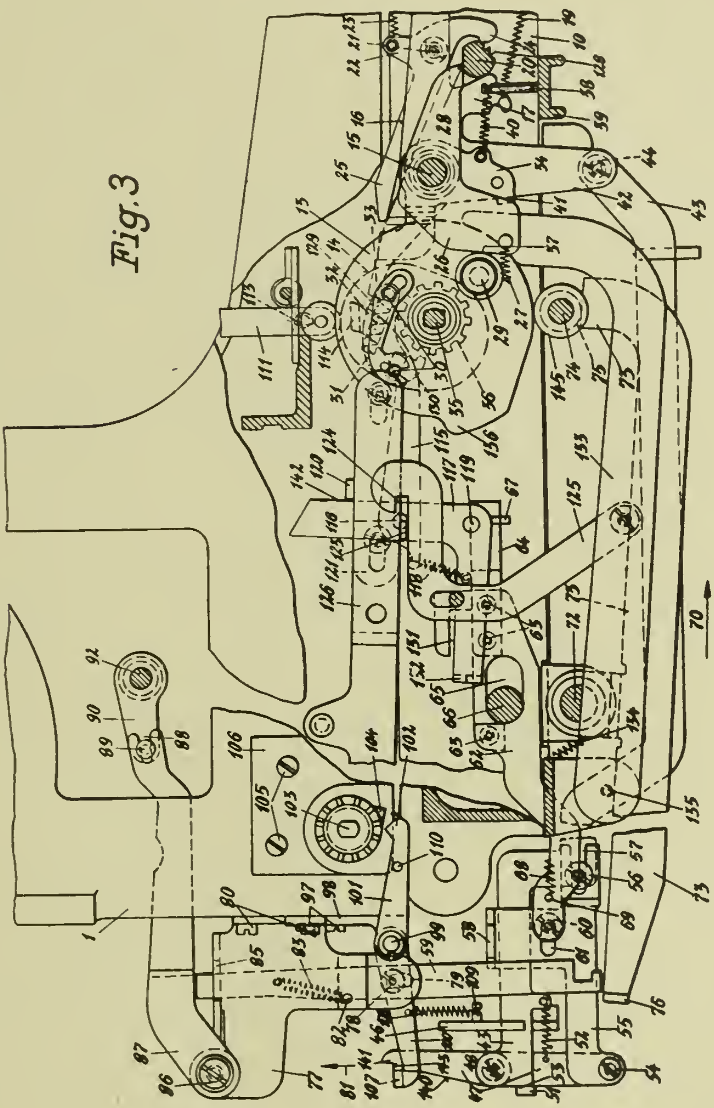


Fig. 3

Inventors,
R. Anschütz
& E. H. Kämmel
By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

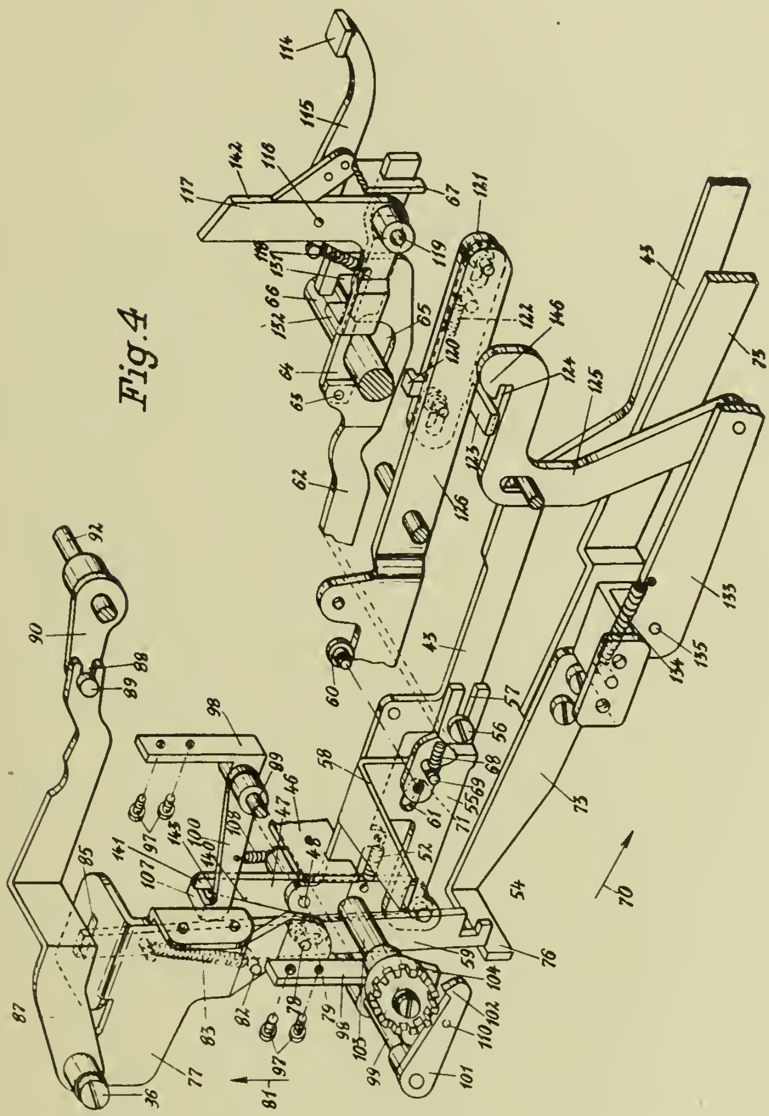
DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES

Filed Jan. 10, 1941

Serial No. 373,996

11 Sheets-Sheet 4

Fig. 4



Inventors,
R. Anschütz
& E. H. Kämmel
By: Glascock Downing & Seebold
Attys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES

Filed Jan. 10, 1941

Serial No. 373,996

11 Sheets-Sheet 5

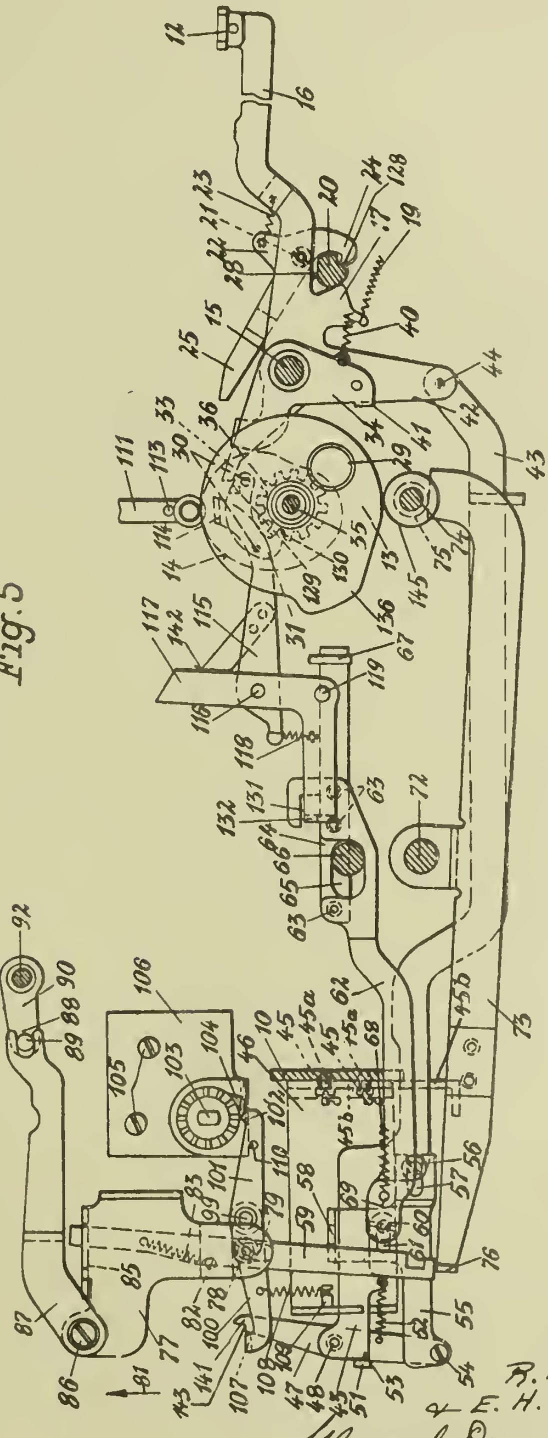


Fig. 5

Inventors
R. Anschütz
& E. H. Kämme
By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES

Filed Jan. 10, 1941

Serial No. 373,996

11 Sheets-Sheet 6

Fig. 6

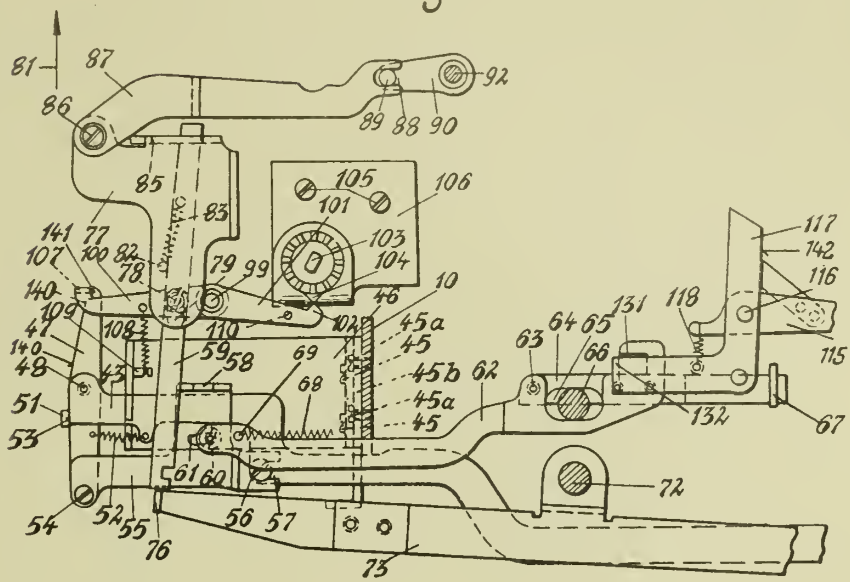
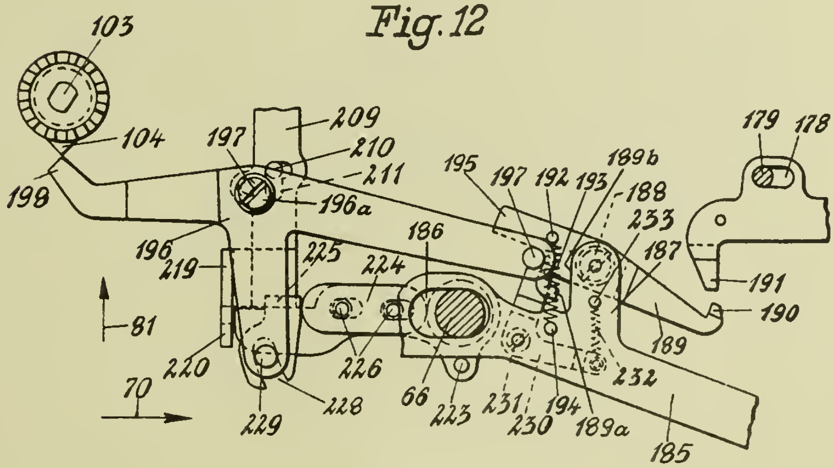


Fig. 12



Inventors,
R. Anschütz &
E. H. Kümmel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

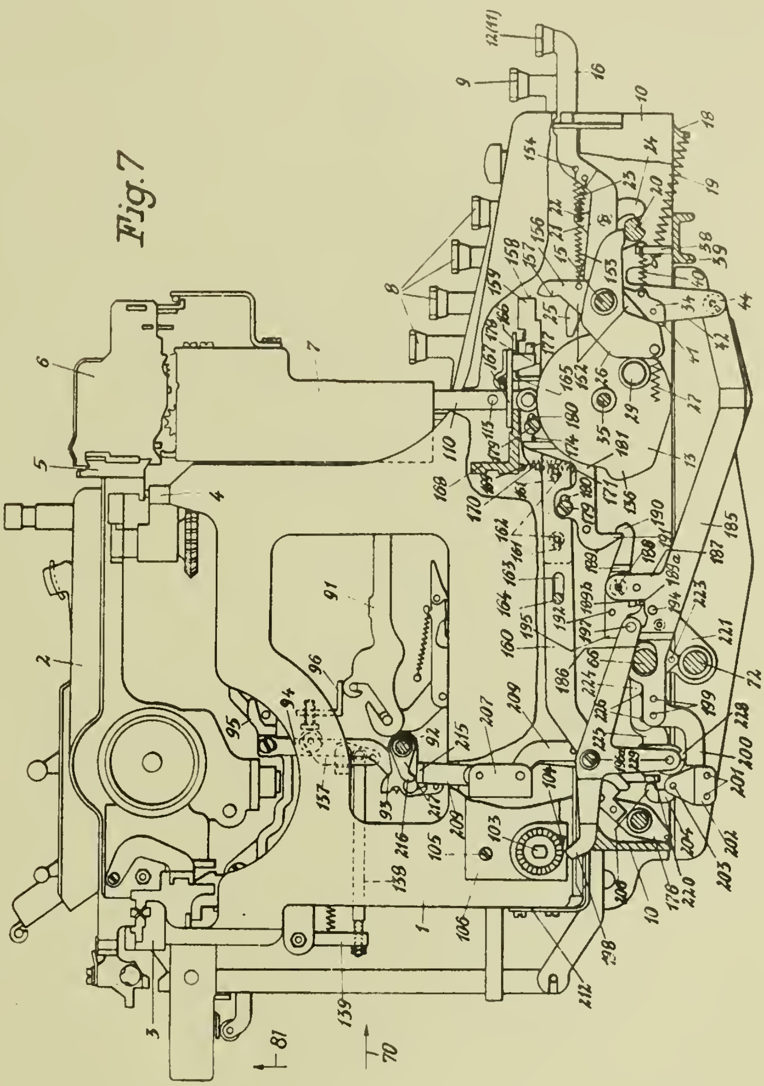
R. ANSCHÜTZ ET AL

DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES

Filed Jan. 10, 1941

Serial No. 373,996

11 Sheets-Sheet 7



Inventors,
R. Anschütz &
E. H. Kämmel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

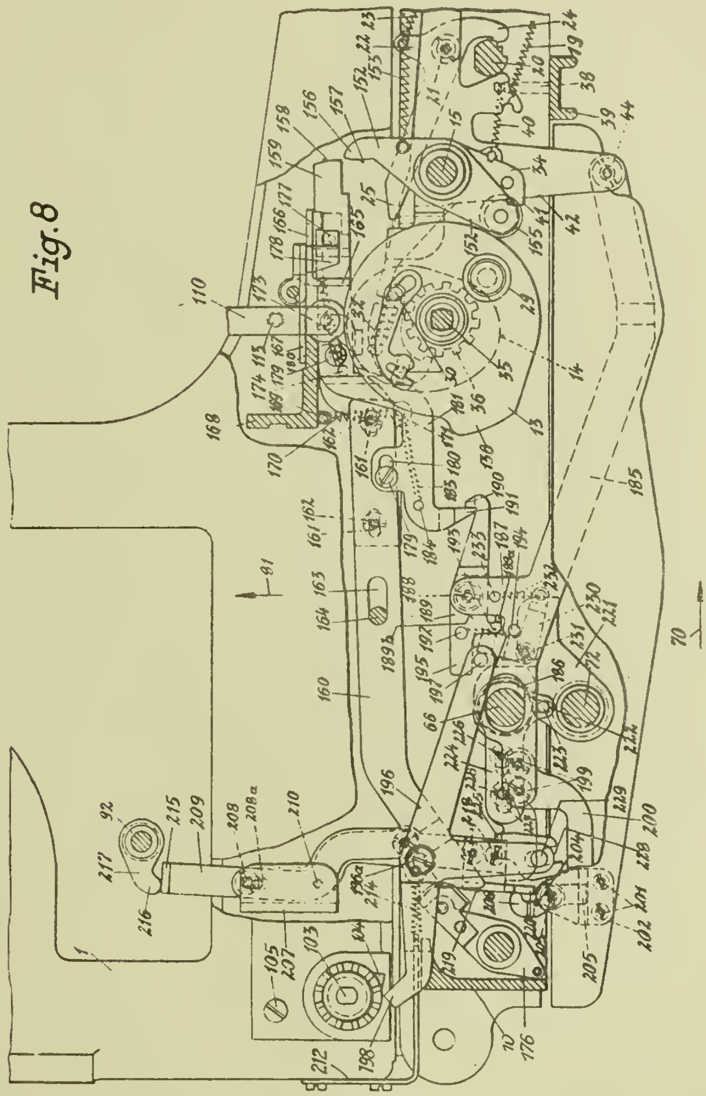
BY A. P. C.

R. ANSCHÜTZ ET AL
DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING
AND SIMILAR MACHINES
Filed Jan. 10, 1941

Serial No.
373,996

11 Sheets-Sheet 8

Fig. 8



Inventors,
R. Anschütz & E. H. Kämmel

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

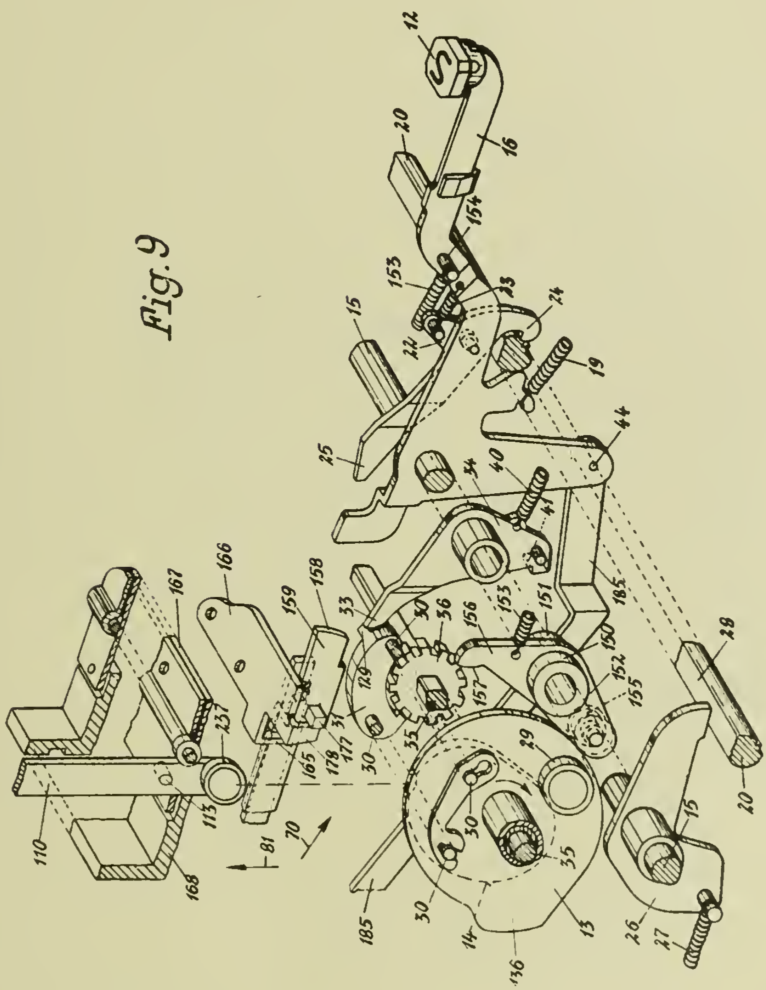
DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES

Filed Jan. 10, 1941

Serial No. 373,996

11 Sheets-Sheet 9

Fig. 9



Inventors,

R. Anschütz & E. H. Kämmel

By: Glascock Downing & Seebold

Attys.

PUBLISHED	R. ANSCHÜTZ ET AL	Serial No.
MAY 25, 1943.	DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES	373,996
BY A. P. C.	Filed Jan. 10, 1941	11 Sheets-Sheet 10

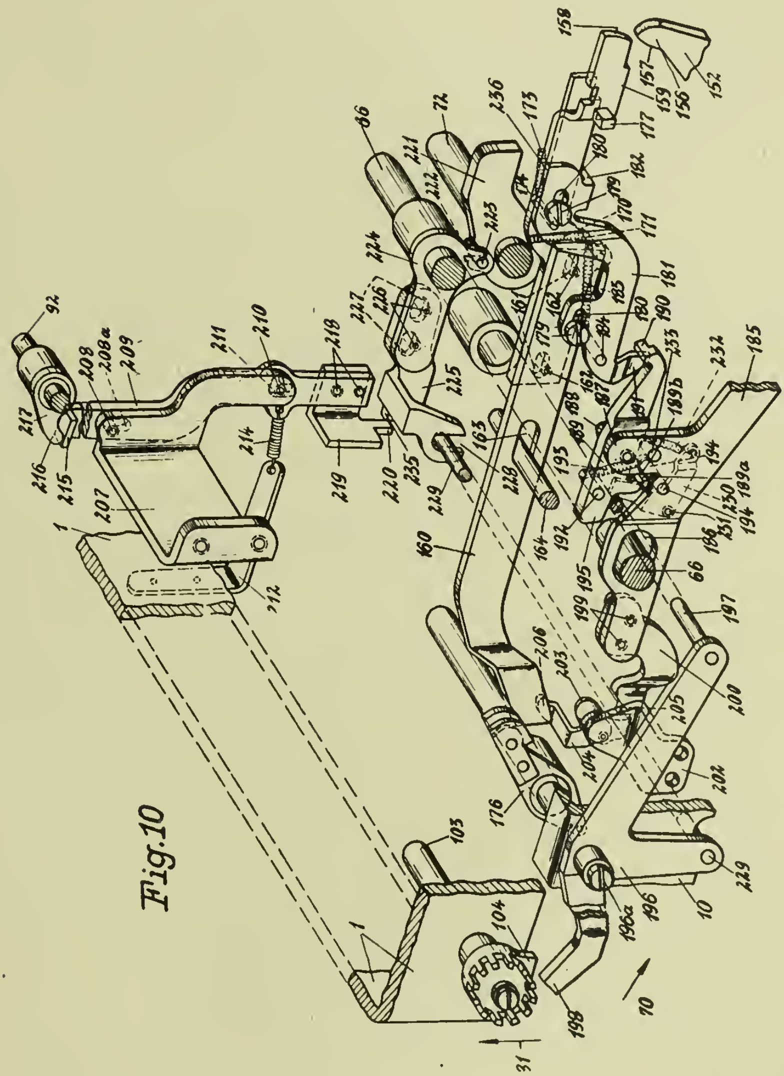


Fig.10

Inventors,
R. Anschütz & E. H. Kämmel

By: Glascock Downing & Seebold
Attys

PUBLISHED

MAY 25, 1943.

BY A. P. C.

R. ANSCHÜTZ ET AL

DEVICE APPLICABLE FOR BOOKKEEPING-CALCULATING AND SIMILAR MACHINES

Filed Jan. 10, 1941

Serial No. 373,996

11 Sheets-Sheet 11

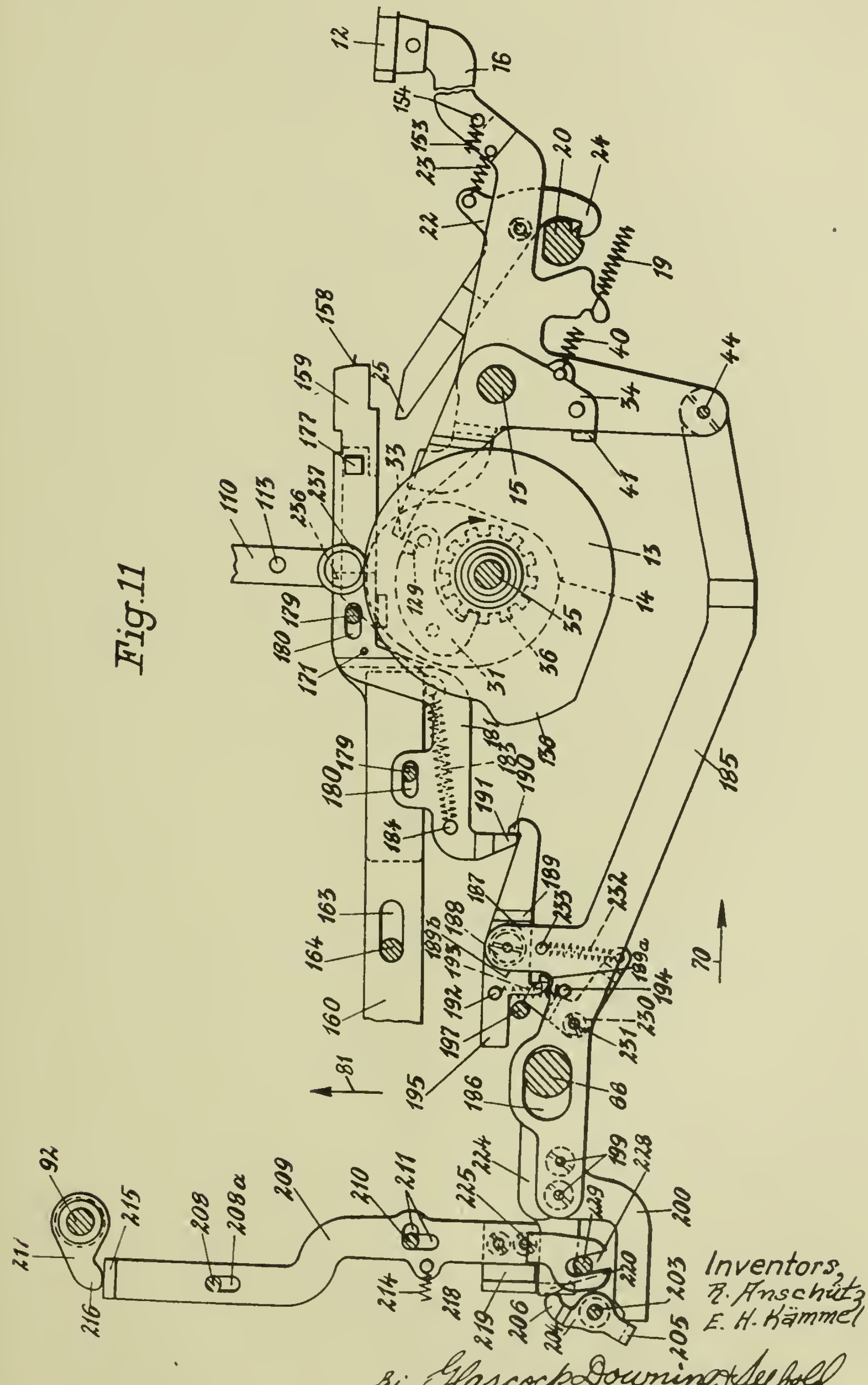


Fig.11

Inventors,
R. Anschütz
E. H. Kämmel

By: Glascock Downing & Seebold
Attys.

Published May 25, 1943

Serial No. 374,216

ALIEN PROPERTY CUSTODIAN

WHEELED UNDERFRAMES, ESPECIALLY FOR TRAILERS OF MOTOR CARS

Kurt Schröter and Hans Schröter, Wechmar/Gotha-Land, Germany; vested in the Alien Property Custodian

Application filed January 13, 1941

This invention relates to wheeled underframes, especially such suited for trailers of motor cars and having the wheel axis supported on the longitudinal middle carrier of the underframe in such a manner as to be able to oscillate thereon, the thus arranged axles being connected with one another by a compensating member.

The present improved construction is distinguished from the known wheeled motor car underfame in which a separate compensating lever is used which connects the axles that are oscillatable, counter to one another by the feature that the compensating member is formed by the body itself of the car, the body being supported in the vertical longitudinal middle plane of the car on supports firmly connected with the wheel axles in such a manner as to be articulable to all sides, the body being, furthermore, rotatably supported on a vertical pivot firmly secured to the longitudinal middle carrier. By utilising the body itself as compensating member and doing away, therefore, with separate compensating members the manufacture of the cars is simplified and renders less expensive, as well as less sensitive, the more, as separate joints requisite when separate compensating members are saved; finally, the weight of the cars is reduced.

The invention is illustrated diagrammatically and by way of examples on the accompanying drawings, on which Figure 1 is a side-view of a car designed according to our invention; Figure 2 is a front view of the same car; Figure 3 is a plane thereof; Figure 4 shows a rear view, and Figure 5 is a view similar to Fig. 3 or 4 and shows a somewhat modified constructional form in which the axles are provided with springs.

On the drawings 1 denotes the front axle and 2 the rear axle which both are suspended in the manner of pendulums and may for this purpose be firmly connected with sleeves 4, 5 supported turnably upon the longitudinal middle carrier 3. Said axles are, furthermore, equipped with supporting struts 6 and 7 carrying at their upper ends globular pivots 8 and 9, situated within correspondingly shaped sockets 11 and 12 which are rigidly connected with the body of the car, so that the body rests upon the axles 1 and 2 by the intermediary of the ball-joints 8, 9, 11 and 12, formed by said pivots and sockets.

The longitudinal carrier 3 is equipped between the axles 1 and 2 with an upwardly directed pivot 13 upon which is shoved a hollow cylindrical lug 14 having a somewhat larger diameter and being rigidly connected with the body 10. Said lug may, besides, be connected with the body by gusset plates 15 and 16. The body can, therefore, be turned in the horizontal plane on the pivot 13, whereas it is held in the vertical plane by said pivot, as well as by the longitudinal carrier 3 and the axles 1 and 2. It assumes, therefore, compulsorily a middle portion between said axles when these are turned around the carrier 3.

The axles 1 and 2 which are shoved upon the carrier 3 by the intermediaary of their sleeves 4 and 5 are prevented from being withdrawn from said carrier by the ball-joints 8, 9, 11 and 12 which constitute the connection between the said axles and the body 10. When this latter is lifted off from the ball-joints 8 and 9, the axles, or their sleeves 4 and 5 respectively, can be freely shifted along the longitudinal carrier 3 and easily be withdrawn therefrom which fact appears that a car designed according to this invention can be assembled and taken to pieces in an extraordinarily convenient manner.

One of the two surfaces of the cylinder parts 13 and 14 which slide upon one another can be provided in known manner with a covering of asbestos, compressed peat, a braking material or any equivalent material able to obviate metallic friction at this place, as well as wear and tear of the parts 14 and 15 and rendering at the same time movement of the body 10, or of the axles 1 and 2 respectively, difficult. In order to increase this effect the sleeve 14 which is situated upon the vertical pivot 13 and is firmly connected with the body, or with the longitudinal middle carrier respectively, is slotted and so designed as to permit re-tensioning.

The modification illustrated in Fig. 5 differs from the above described construction by the feature that at least one leaf-spring 17, may be, however, a plurality of such springs, is, or are, inserted between the axle 2 and the ball-pivot 9. Said spring is secured at its end 18 to the sleeve 19, whereas its end 20 is shiftable upon the support 21 transversely to the direction of motion of the car. Owing to the insertion of said springs 17 the body 10 which constitutes the compensation member is spring-supported with respect to the axles and the car is, therefore, rendered suitable also for higher speeds.

The springing between the axles 2 and the body can be designed also in another manner, for instance, in this way that instead of the rigid axle 2 oscillating semi-axles and instead of leaf-springs for instance helical springs are used, the gist of the invention and its scope being not in the least changed thereby.

KURT SCHRÖTER.
HANS SCHRÖTER.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

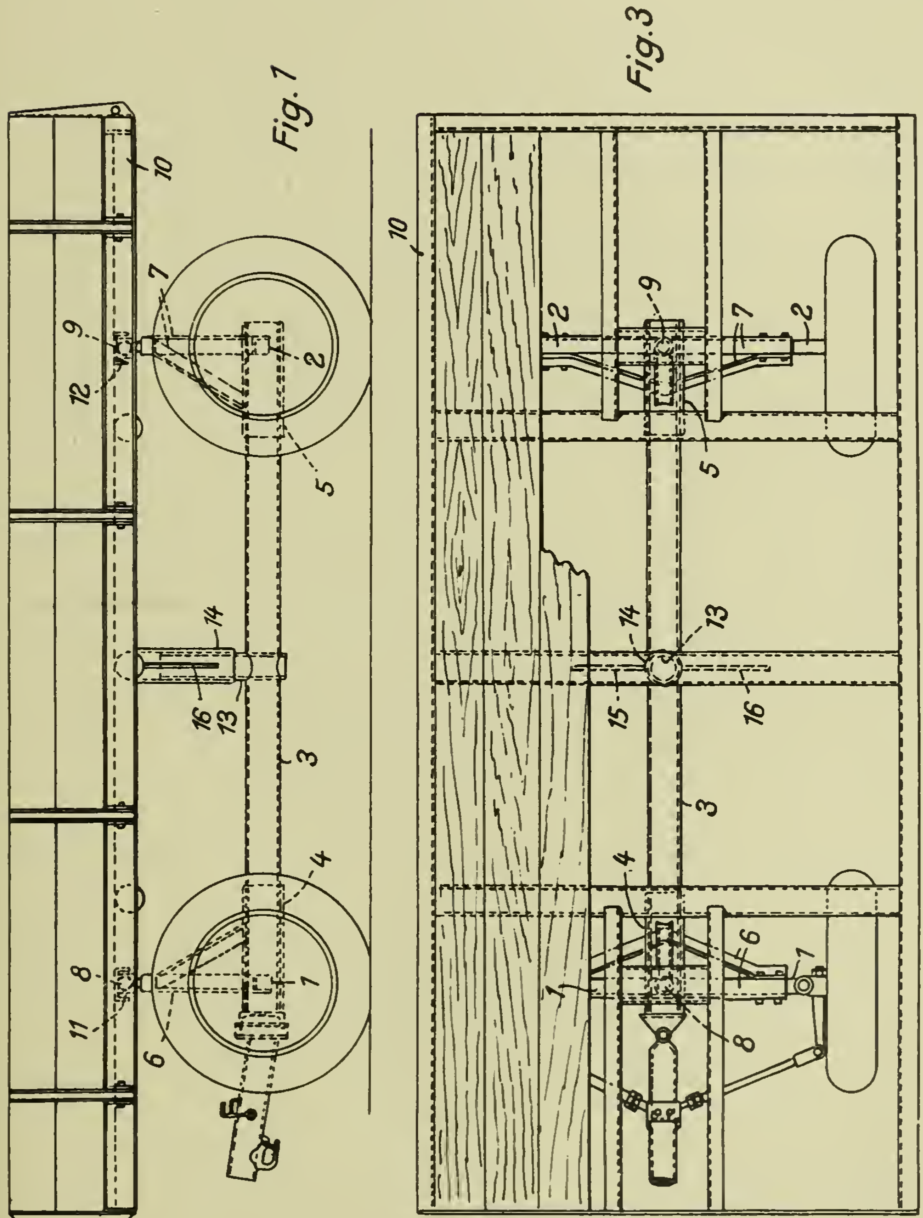
K. SCHRÖTER ET AL

WHEELED UNDERFRAMES, ESPECIALLY
FOR TRAILERS OF MOTOR CARS

Filed Jan. 13, 1941

Serial No.
374,216

2 Sheets-Sheet 1



Inventors:
Kurt Schröter and Hans Schröter
BY
Richards & Geier
ATTORNEYS

PUBLISHED

MAY 25, 1943.

BY A. P. C.

K. SCHRÖTER ET AL
WHEELED UNDERFRAMES, ESPECIALLY
FOR TRAILERS OF MOTOR CARS
Filed Jan. 13, 1941

Serial No.
374,216

2 Sheets-Sheet 2

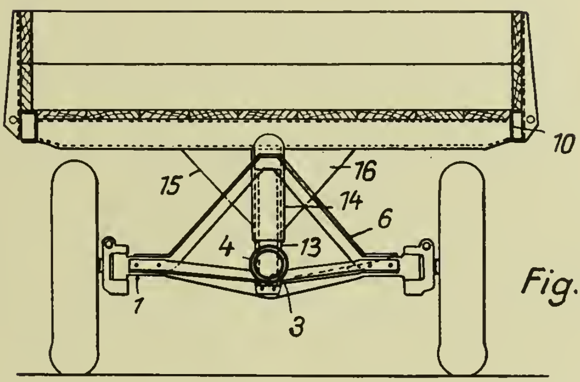


Fig.2

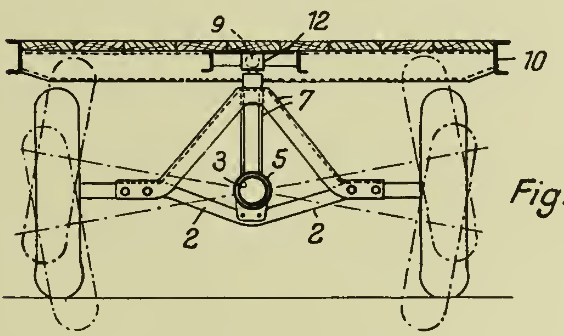


Fig.4

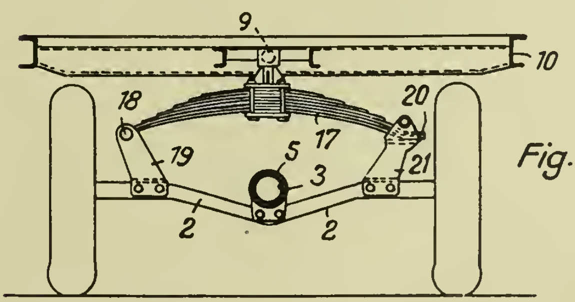


Fig.5

Inventors:
Kurt Schröter and Hans Schröter
By
Richards & Geier
ATTORNEYS

Published May 25, 1943 Serial No. 374,217

ALIEN PROPERTY CUSTODIAN

CARS, ESPECIALLY TRAILERS, WITH TILTABLE BODY

Kurt Schröter and Hans Schröter, Wechmar/Gotha-Land, Germany; vested in the Alien Property Custodian

Application filed January 13, 1941

Our invention relates to cars especially trailers, with tiltable body; more especially, it relates to equipping cars of this type with a compensation device so designed as to be able to swing the second axle counter to the first if this axle is being swung owing to the car running on uneven ground, and to hold the wheeled underframe in a middle position between the thus moved axles.

With freight cars and trailers much used on building yards and for agricultural work there arises on uneven ground the drawback that the strong torsional strains constitute additional strains on the frame members and the lockings between the tilting frame and the supporting frame can be actuated only with the greatest difficulties if the car is torsional. These drawbacks are overcome according to the present invention, by equipping cars of the above-mentioned type with a ground compensation device whereby, moreover, the further advantage is obtained that the body can be tilted relatively to the axle frame so that it is possible to give the body a horizontal position in spite of the freight surface being, perhaps, in an inclined one. The new arrangement presents, furthermore, also the possibility that for lifting a wheel from the ground, for instance for exchanging a damaged tire, a car jacking device is no more necessary.

Another advantage presented by our invention is that the car body is guided during the tilting, and the movement of the axle frames in upward direction is restricted. The car designed according to this invention is, for said purpose, provided with supporting rolls and curved lugs engaging one another when the body of the car is tilted so that said rolls roll along upon said lugs and the supporting bearings of the tiltable body are lifted off the frame carriers. This arrangement renders it possible to obtain a sufficiently large tilting angle even if the loading surface is perhaps, located approximately near the ground, the point of gravity of the load being, nevertheless, not elevated during the tilting procedure.

The invention is illustrated diagrammatically and by way of example on the accompanying drawings on which Figure 1 is a side-view of a trailer having a tiltable body and being equipped with a compensation device according to this invention. Figure 2 is a rear view of said trailer, Figure 3 is a view similar to Fig. 2 and shows the body tilted. Figure 4 is likewise a view similar to Fig. 2, but showing one wheel lifted; and Figure 5 shows partly in side-view and partly in axial section a mechanism used when the body of the car is tilted, the mechanism proper being shown in section and a spindle supporting it being shown in side-view.

The wheeled frame of the car, or the body 1 respectively, is tiltable with respect to the longitudinal middle carrier 2. The frame or body 1 is, for this purpose, supported together with the supporting bearings 13 upon the axle frames 11 and 12 which are turnable, together with said bearings, on said carrier 2. This latter is connected with the tiltable body 1 by a member 3 which is transversely shiftable and preferably adjustable in its longitudinal direction. Said member 3 is formed, in the example shown, by a spindle engaging the body 1 by the intermediary of a ball-joint 5; said spindle carriers a two-pivot nut 6 which is turnably supported on an arm 7 of the longitudinal carrier 2 in a transverse plane of the same. The spindle is preferably at both ends designed in such a manner that a hand-crank 4 can be applied to it. By turning the crank in the one or the other direction the nut 6 is correspondingly moved along the spindle whereby the distance between the arm 7 which is rigidly connected with the longitudinal carrier 2 and the joint-point 5 of the spindle 3 at the frame or body 1 is varied. The body 1 will, therefore, be tilted to the one or other side according to the direction of rotation of the spindle, the body turning first on the carrier 2 with its supporting bearings 13.

The ground compensation device itself may be of any desired known design. In the constructional form illustrated by way of example it consists of a lever 8 turnably supported on a vertical pivot 18 (Fig. 1) projecting forth from the arm 7 that is connected with the longitudinal carrier 2, the ends of said lever 8 are ball-shaped and engage correspondingly shaped joints 17 whereby it is connected with the axle frames 11 and 12. These latter carry two upwardly directed stiffening struts 16, the points of junction of which constitute connecting joints for the compensation lever 8 which is slightly movable in vertical direction also upon its pivot 18. The lever 8 maintains, therefore, the longitudinal carrier 2 positively in a middle position relatively to the axle frames 11 and 12.

For guiding the body 1 while the tilting procedure is going on supporting rolls 9 and curved lugs 10 are provided which are connected with said body, or with the axles frames 11 and 12 respectively. If by turning the hand crank 4 and the spindle 3 the body has been laterally so

much inclined that the supporting rolls 9 attached to the body push upon the said lugs, which are, at least in the example shown, attached to the two upwardly directed stiffening struts 16, the body will when the rotation of said spindle is continued be lifted together with its supporting bearing 13 from the longitudinal carrier 2, the supporting rolls 9 located on the tilting side rolling them along upon the curved lugs 10 located on the same side. The supporting rolls serve at the same time for limiting the extent of deviation of the axle frames 11 and 12. It is by this arrangement prevented that the bottom of the body pushed upon the tyres, and at the same time the advantage is attained that in spite of the tilting angle of the body 1 being the largest possible the loading surface does not lie too low in its middle position, viz, when it is not tilted.

The body is, furthermore, guided also positively by the scissor levers 14 inserted between the supporting bearings 13 and the longitudinal carrier 2, so that said bearings always contact again with this carrier when the body is tilted in rearward direction.

The supporting bearings 13 are lifted from the longitudinal carrier 2 also when the car is running over a comparatively large obstacle met with in the road, viz, when the axle frames 11 and 12 are so much turned with respect to one another as well to the wheeled underframe, or the body 1 respectively, that the supporting rolls 9 contact with the curved lugs 10 of the said frames.

In all these cases the bottom of the body gives way automatically in upward direction if the wheel tyres approach it. It is, therefore, no more necessary to provide the bottom with so-called wheel boxes into which the head portion of every wheel reaches.

If a wheel axle is connected with the body 1 at one side by means of an unyielding member, for instance a chain 15 (Fig. 4), and if the body is then laterally tilted, this latter takes the wheel located in the proximity of the chain along with it in upward direction, so that, for instance for exchanging a wheel tyre, the otherwise requisite jacking or hoisting device can be dispensed with.

If low speeds are sufficient to attain the purposes in view, the axles need not be connected by springs with the body whereby the advantage is attained that the net weight of the car is considerably reduced.

In Fig. 5 the ball joint 5 by the intermediary of which the spindle 3 engages the tiltable body is separately illustrated and drawn on a considerably larger scale relatively to the other figures. Said joint is provided with a transverse ball bearing 20 active at both sides and inserted between two half-spheres 19 turnably supported in correspondingly shaped hollow bearings and able to take up the lateral pressure. The hollow ball bearing is bipartite and one of its parts (21) is adjustably connected with the other, stationary part for instance by means of screw-threads. This other part may be made integral with the body 1, if desired. By designing the ball-joint 5 in the just described manner the friction arising within it is greatly reduced.

KURT SCHRÖTER.
HANS SCHRÖTER.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

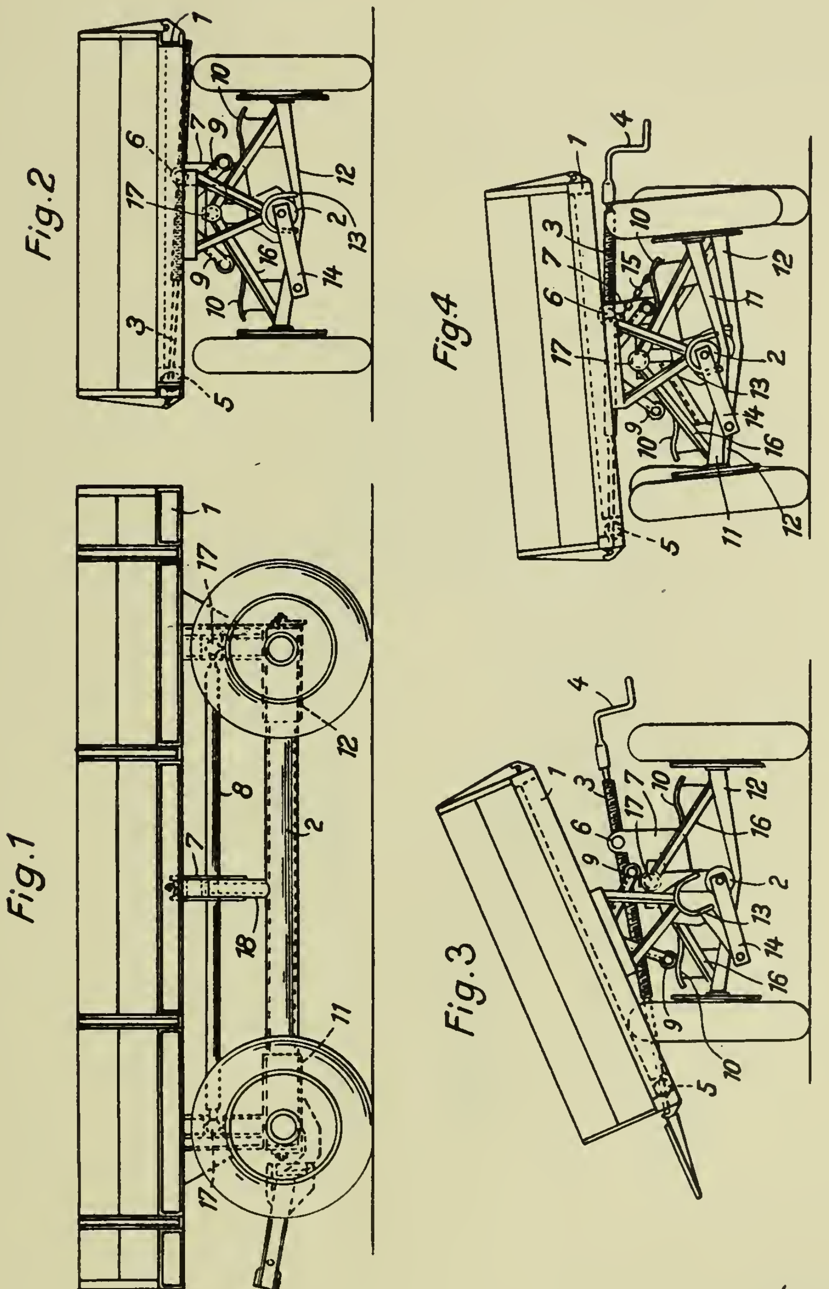
K. SCHROTER ET AL

CARS, ESPECIALLY TRAILERS, WITH TILTABLE BODY

Filed Jan. 13, 1941

Serial No. 374,217

2 Sheets-Sheet 1



Inventors:
Kurt Schröter and Hans Schröter
By Richards & Geier
ATTORNEYS

PUBLISHED

MAY 25, 1943.

BY A. P. C.

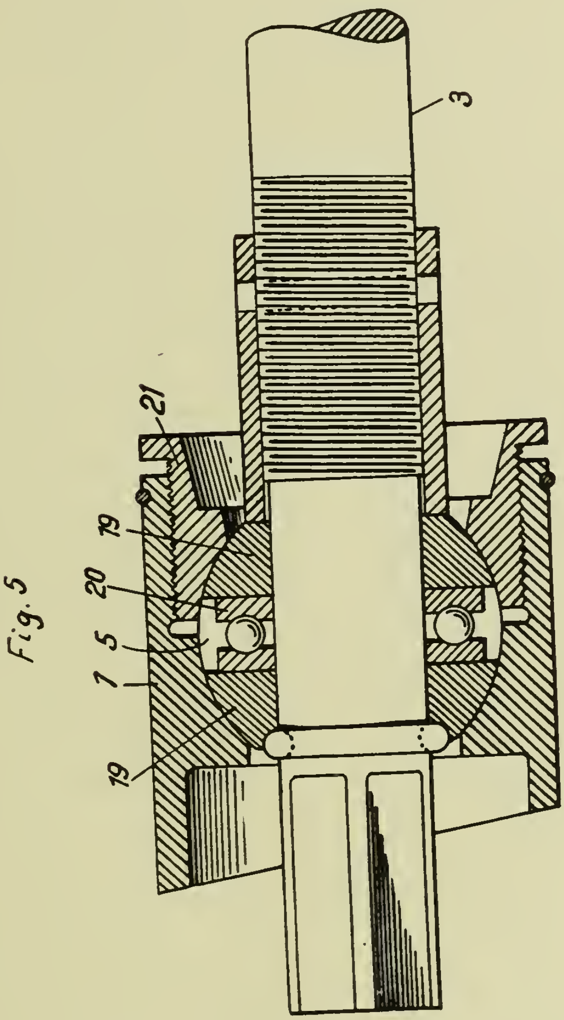
K. SCHROTER ET AL

CARS, ESPECIALLY TRAILERS, WITH TILTABLE BODY

Filed Jan. 13, 1941

Serial No. 374,217

2 Sheets-Sheet 2



Inventors:
Kurt Schröter and Hans Schröter
By Richards & Geier
ATTORNEYS

Published May 25, 1943

Serial No. 374,322

ALIEN PROPERTY CUSTODIAN

SYSTEM FOR DIRECTIVE RADIATION OF ELECTROMAGNETIC WAVES

Hatsutaro Matsudaira, Hsingking, Manchoukuo; vested in the Alien Property Custodian

Application filed January 14, 1941

This invention relates to a system for directive radiation of electromagnetic waves for obtaining an equisignal intensity zone to meet a predetermined direction by the interlocking of different directive radiations from two dipole antennae of a half wavelength.

The object of this invention is to provide a directive radiating system of a simple construction, having high efficiency of feeding antennae, and without troubles of so-called "key-clicks" when detecting a continuous equisignal zone of radiations.

Among many applications, the invention may be particularly employed for finding a runway of aerodrome by detecting, on aircraft, the equisignal zone of radiation, which direction being predetermined to the runway, when the sight is hindered by clouds, fogs and at night, or during blind flight.

The invention will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 shows an arrangement of a vertical half wave antenna and a reflector,

Figure 2 shows directive characteristics of radiation of the antenna system when a method of feeding antenna and the length of a reflector have been changed,

Figure 3 shows two vertical antennae of a half wave-length and its feeding system,

Figure 4 shows two antennae, one acting as a radiator and the other as a reflector,

Figure 5 shows the similar antennae, but with their relation reversed, and

Figure 6 shows a connection of said two antennae at the instant they are simultaneously fed together.

When we set vertically a metal rod A of a half wavelength excited from an energy source V with a tuned frequency, with a height h above the ground G, and another metal rod B slightly longer than a half wavelength, said two rods A and B being arranged parallel and apart a quarter wavelength from each other, it is well known that the rod A acts as a vertical antenna and the rod B as a reflector by induced electric current from the rod A, and we get a radiating field of a directive characteristic shown as a polar curve C as shown in Fig. 2, which pattern of radiation will hereinafter be referred to as "the first case" for the sake of convenience in explanation.

Now, assume the case in which the metal rods A and B are put in inverse arrangement, that is to say, the length of the rod B is made equal to a half wavelength energized with the same source V, and the rod A is made slightly longer than a half wavelength. Then the rod B acts as a radiator and the rod A as a reflector, and the pattern of the field radiating from this arrangement must be represented by a polar curve D which is perfectly symmetrical to the curve C of "the first case". Said pattern D will hereinafter be referred to as "the second case".

In both cases, the height h of the metal rods A and B above the ground may give influences to directive characteristics in azimuthal planes, but not to characteristics in horizontal planes. From the above mentioned patterns of Fig. 2, it is obvious that points of intersection K and H of the curves C and D and a center o of the arrangement of the rods A and B must be on a straight line which is at right angle to a plane containing the rods A and B, because of the symmetry of the curves C and D. It is to be understood that, in order to obtain a radiation field having such a directive characteristic shown as polar curves C and D, the impedance of the rod acting as a reflector must always be suitably inductive.

According to this invention, for making the impedance of the reflector inductive, I employ a method which will be described with reference to Fig. 3. In Fig. 3, the length of the metal rods A and B is made equal to a half wavelength and divided into two parts at the mid points, where two parallel-wire-feeders W and Y are connected, length of which being preadjusted to have a reasonable reactance for any rod acting as a reflector.

When a couple of contact points e and f of a changeover relay S, to which is connected a main feeder line from the energy source V, is brought into contact with a couple of contacts c and d of the feeder W, the overall connection will be as shown in Fig. 4. Then, the metal rod A, excited from the source V through the main feeder F and a matching apparatus Q, acts as a vertical antenna, and the rod B has an open-ended feeder Y connected at its center portion, being the current loop of the rod.

From a theoretical basis, it is understood that an equivalent reactance X of an open-ended feeder line is expressed as.

$$X = Z \cot \frac{2\pi}{\lambda} l \qquad (1)$$

where Z: surge impedance of a feeder line,
λ: wavelength, standing on a feeder line,
l: length of a feeder line.

The end points u and v of feeder Y is a current-loop of the rod B, then the equivalent reactance

at points u and v must be inductive, when the length l of the feeder Y satisfies the following equation:

$$\frac{\lambda}{4}n<l<\frac{\lambda}{4}(n+1) \qquad (2)$$

where λ: wavelength standing on a feeder line,
n: odd integer.

If we take appropriately the length l within a scope of satisfying the equation (2) and without a considerable loss resistance, the metal rod B has an inductive reactance and acts as a reflector, in which all are the same as "the first case" already mentioned, and this enables obtaining a radiating field of polar curve C shown in Fig. 2.

When the couple of contact points e, f of the relay S comes in contact with a couple of contact points r, t, the overall connection of the system will be as shown in Fig. 5, which is quite inverse and symmetrical to that of Fig. 4, then a radiating field of this connection must have the polar curve D shown in Fig. 2. In both cases, the matching apparatus Q of the main feeder F must be adjusted to obtain the maximum efficiency of feeding from the energy source V.

Now, if the change-over relay S is so designed that the couple of contact points e and f moves together according to predetermined signals, for example, Morse signals E (dot) for Fig. 4, and T (dash) for Fig. 5, then radiating fields of polar curves C and D will be alternately radiated by keying the relay S following the above signals, which will be detected with a suitable receiving apparatus. For example, in a direction O—N—M of Fig. 2, stronger E (dot)-signals proportional to O—N will be repeatedly detected and weaker T (dash)-signals proportional to O—M in intervals of E (dot)'s, and, in other direction O—R—U, stronger T (dash)-signals and weaker E (dot)-signals, proportional to O—U and O—R will alternately be detected. On a straight line, a direction of intersection of polar curves C and D, both signals are superposed with equal intensity, causing a continuous signal. Thus, in an aerodrome, when we assign the direction of equisignal intensity KOH to the runway, the pilot during blind flight may search the runway by employing suitable detecting apparatus.

However, the method of interlocking two signals E and T is very important. The shortest interruptions of equisignal radiation, if any, cause "key-clicks" which destroy the continuous equisignal, and make it difficult to detect the runway, especially in aural detection. To overcome this difficulty, according to this invention, the change-over relay S is designed in the following manner. Two couples of contact points c, d and r, t are made of adjustable spring metal and the distances between the same and couple of contacts e, f are so adjusted that there will be an extremely short interval of time of simultaneous contacting with both couples of c, d and r, t on the way of motion of the contacts e, f from c, d to r, t and vice versa. Therefore, in this invention, there is not any instant of interruption of exciting antenna from energy source V, but both antennae are simultaneously excited for a very short interval of time, as in the connection shown in Fig. 6. In said connection of Fig. 6, both antennae A and B are excited in same phase and magnitude, and of which directive characteristic of radiation must be such a polar curve P as shown in Fig. 2, and its direction of maximum intensity coincides with the equisignal intensity KOH. It will be necessary to equalize the field intensity of polar curve P to that of polar curves C and D in the direction of KOH to completely avoid "key-click". If an antenna input of Fig. 6 is equal to that of Figs. 4 and 5, the field intensity of polar curve P may always be stronger than that of polar curves C and D in the direction of equisignal KOH, but the main feeder F is so adjusted as to match the antenna system in the connections of Figs. 4 and 5 to obtain the maximum efficiency of feeding energy. Therefore, in the connection of Fig. 6, there will be a mismatching of feeder F and decrease of the input of antenna, which causes the field intensity of polar curve P decreasing to substantially equal value of the intensity of the polar curves C and D in the direction of equisignal KOH, and the troubles of "key-clicks" are practically removed.

HATSUTARO MATSUDAIRA.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

H. MATSUDAIRA
SYSTEM FOR DIRECTIVE RADIATION
OF ELECTROMAGNETIC WAVES
Filed Jan. 14, 1941

Serial No.
374,322

2 Sheets-Sheet 1

Fig. 1.

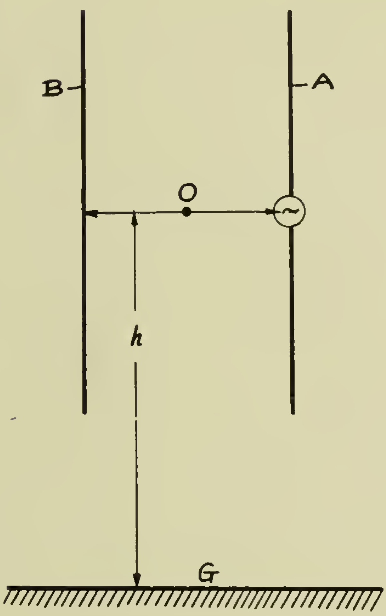
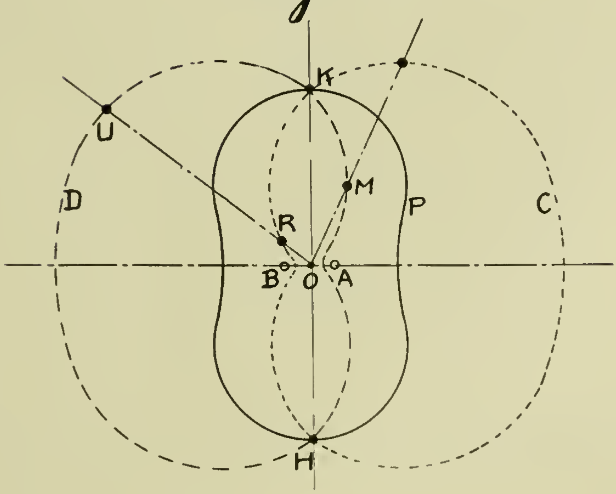


Fig. 2.



INVENTOR:
HATSUTARO MATSUDAIRA
BY Haseltine, Lake & Co.
ATTORNEYS

PUBLISHED

MAY 25, 1943.

BY A. P. C.

H. MATSUDAIRA
SYSTEM FOR DIRECTIVE RADIATION
OF ELECTROMAGNETIC WAVES
Filed Jan. 14, 1941

Serial No.
374,322

2 Sheets-Sheet 2

Fig. 4.

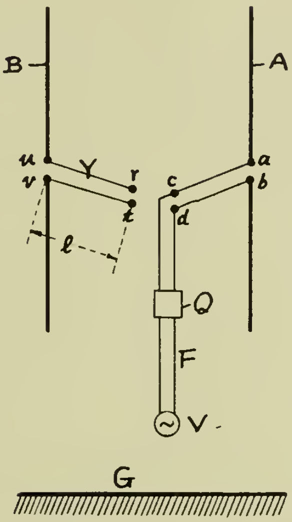


Fig. 3.

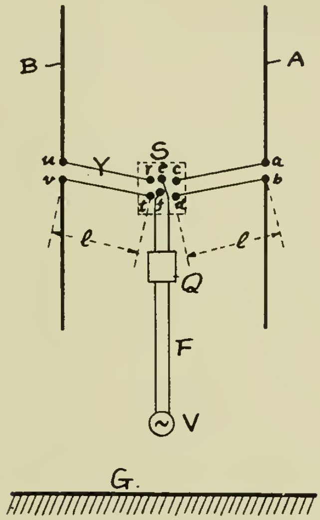


Fig. 6.

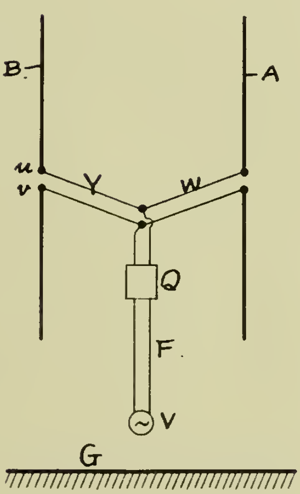
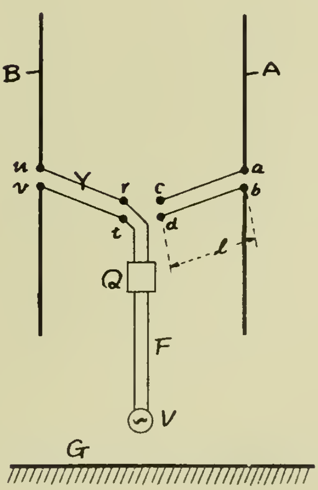


Fig. 5.



INVENTOR:
HATSUTARO MATSUDAIRA
BY Haseltine, Lake & Co.
ATTORNEYS

Published May 25, 1943

Serial No. 374,404

ALIEN PROPERTY CUSTODIAN

ARRANGEMENT FOR PREVENTING THE ESCAPE OF OIL FROM THE AXLE BOXES OF RAILWAY VEHICLES

Gustav Stromeier, Berlin-Charlottenburg, Germany; vested in the Alien Property Custodian

Application filed January 14, 1941

This invention relates to improvements for railroad vehicles and in particular to an arrangement, which is adapted to prevent the escape of oil from the axle boxes of such vehicles.

It is an object of my invention to provide for a certain clearance between the packing elements of said axle boxes so as to secure always a close contact of such elements; more in detail, the invention consists in providing a curvated or spherical interface between the oil-collecting member of the so called oil thrower and a supporting ring surrounding it.

A still further object of my invention resides in the arrangement of elastic packing layers in the area of sealing interfaces.

It is to be noted that in the case of railroad cars and other vehicles to be driven on rails, axle bearings are chiefly used as axle boxes, in which adjoining the space for the bearing proper, a packing chamber is provided, within which devices are arranged for the purpose of preventing the oil from escaping along the axle. Types are also known, in which a circulating oil thrower (splash ring) is provided within said packing chamber, so as to be displaceable along the axle-journal. The packing devices hitherto known did not, however, prove to be satisfactory, because the leakage of oil is not prevented by them in a reliable manner.

The present invention aims to overcome said drawbacks. It consists, generally speaking, of a bearing ring, the internal cylinder surface of which in the axial direction is of spherical shape, the correspondingly shaped external cylinder surface of an annular oil collection chamber or member being borne by said spherical surface. The lateral walls of this oil collection chamber are provided with oil scraping edges which rest against the oil thrower. In consequence of the globular shape of said bearing surfaces arranged between the bearing ring and the oil collection chamber, a certain amount of clearance exists between said two parts, whereby the scraping edges are enabled to press themselves closely on to the oil thrower, irrespective of the relative position of the axle and the axle box. Due to this design it is warranted that under any circumstances the scraping edges will act in an efficient manner and without any danger of one-sided loads caused by a pressure upon the oil thrower placed on the axle being able to make themselves felt.

In the accompanying drawings two practical embodiments of the invention are illustrated by way of example, as follows:

Figure 1 is a section across the tightening chamber and the axle box, seen in an axial direction, whereas

Figure 2 is a cross-section of the device along line A—B of figure 1,

Figure 3 being a cross section of the oil collection chamber along line C—D of figure 2,

Figure 4 representing the inferior part of the device according to figure 1, but at an enlarged scale.

Figure 5 is a corresponding illustration, embodying a slightly altered type of the device, embodying the invention.

From figure 1 it can be seen that the axle-journal *a* is borne in the customary manner within the axle box *b*, the packing chamber *c* being placed so as to adjoin said axle-box. The device under the present invention is placed within the interior of the aforesaid packing chamber. The device consists of a bearing ring *d* which, by means of springs, is pressed on to the partition wall *p*, by which the packing chamber *c* is separated from the axle-box *b*.

The internal cylinder surface of said bearing ring *d* is designed so as to be of spherical shape and to form a segment of a sphere, as can be seen more exactly from figures 4 and 5.

The oil collection chamber *e*, which is designed as a ring having a U-shaped cross section, is borne on this spherical surface of bearing ring *d*. On its external cylinder surface it is of a shape adapted to the corresponding surface of bearing ring *d*, whereby, in its relation to the bearing ring, it is enabled to move in a manner almost resembling that which is rendered possible by a ball bearing. The lateral walls of the oil collection chamber are, in the interior of the latter, provided with oil scraping edges. For this purpose annular members *f* of sheet metal, spaced from one another, are fixed to the internal walls, the radial edges of said members of sheet metal representing the scraping edges, which form oil collection pockets enclosed between them. It is advisable to cut out a portion, i. e. more exactly the top section *f* of the ring, in order to form in this manner a small discharge channel *g*, by which the oil leaking out in top will be led away in a downward direction.

This method of designing the packing device will result in the fact that inexactitudes which cannot be prevented in manufacturing the axle box, will not display a disadvantageous effect. If, for instance, the partition wall *p*, separating the packing chamber *c* from the axle box *b*, is not placed so as to be perfectly perpendicular

in its relative position to the axle, a danger which frequently will be present, the oil collection chamber e of this device has a possibility of adjusting its position in relation to the bearing ring d, and as a consequence thereof the lateral walls of the oil collection chamber will always be placed in a perpendicular direction, as compared with the axle. In this manner the end will be attained that the oil scraping edges within the oil collection chamber will always be able to press themselves in an unobjectionable manner on to the lateral surface of the splash ring n, whereby it is warranted that the oil will be scraped off in a manner free from objection. The scraping edges, and the sheet metal members f, respectively, will furthermore be prevented from exercising a unilateral pressure upon the oil thrower, which under certain conditions would be liable to injure the surface of the axle-journal at the place where the oil thrower is borne.

The oil collection chamber under the present invention is at its base provided with a discharge opening h, through which the quantity of oil scraped-off can be directly fed back to the oil chamber of axle box b. In order to prevent the oil during this re-feeding action from leaking through into the packing chamber c, an elastic packing plate i is arranged between bearing ring d and partition wall p. As already mentioned above, the bearing ring is pressed on to this partition wall by means of springs. The springs k are, as is to be seen more clearly in Figures 4 and 5, covered by a spring cap l which, on its part, is guided by stems m with apertures appropriate to the purpose. Said stems m can in a simple manner be made of sheet metal pressed so as to have a U-shaped cross section, and can be fixed on the bearing ring d by spot-welding. It is, however, also possible to avail oneself for this purpose of any other fixing method.

The packing plate i can be provided with a reinforcement, which is shown in Figure 4. It can, however, also be provided with jagged projections, shown in Figure 5, which due to the spring pressure will adapt themselves to an unevenness, if any, of the partition wall p within the packing-chamber. A labyrinth-packing with a plurality of packing spaces, one of which is placed behind the other is, so to speak, formed in this manner.

Figure 5 shows a similar design also with regard to the oil thrower (splash ring) n. As can be seen from the illustration, the splash ring n is at the surface, on which it rests, provided with an elastic insertion o, which possesses jagged projections. This insertion can be made of rubber, Buna, synthetic resin or any similar resilient material. In the case of little differences of the axle's diameter said jagged projections will be turned down more or less, wherefore, thanks to this special design of the oil thrower, deviations from the exact diameter of the axle can be overcome. At the same time a certain degree of resilience is imparted to the oil thrower by this insertion, such resilience being desirable for its adjustment relative to the axle and to the scraping edges, respectively.

The oil thrower itself may have any desired cross-section, which is, for instance, either rectangular, angular or T-shaped. If the ring (oil thrower) is not designed in accordance with Figure 5, it will be preferable to cut it through in axial direction, in order to increase its elastic effect, whereby it will be enabled to embrace the axle almost like a piston ring.

Figure 4 illustrates a design of the oil thrower, in which the latter is subdivided into two rings in a direction perpendicular to the axle. The elasticity of the oil thrower is thereby increased and, as a consequence thereof it will be rendered easier to place the device on the axle. It is also possible to provide the oil thrower itself with a groove cut in the middle of it, and serving as an oil discharge channel, as can be seen from Figures 4 and 5.

The primary purpose, for which the device is to be employed, is its use for packing the axle-boxes of railroad cars. It can, however, also be used in the case of any other bearings implying the danger that oil will leak out from them. As far as axle-boxes are concerned, which either do not possess an internal partition wall p, or the internal partition wall p of which is provided with perforations, the packing plate i is, as a matter of course, to be arranged so as to adjoin the external wall of the packing chamber, and must be of such design that the device will be pressed on to said wall.

GUSTAV STROMEIER.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

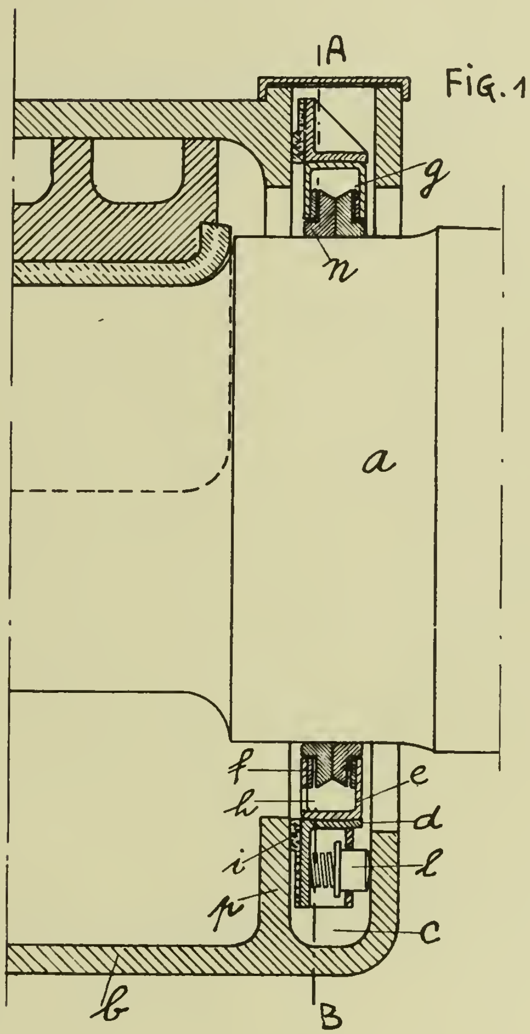
G. STROMEIER

ARRANGEMENT FOR PREVENTING THE ESCAPE OF OIL FROM THE AXLE BOXES OF RAILWAY VEHICLES

Filed Jan. 14, 1941

Serial No. 374,404

3 Sheets-Sheet 1



Inventor:
G. Stromeier

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

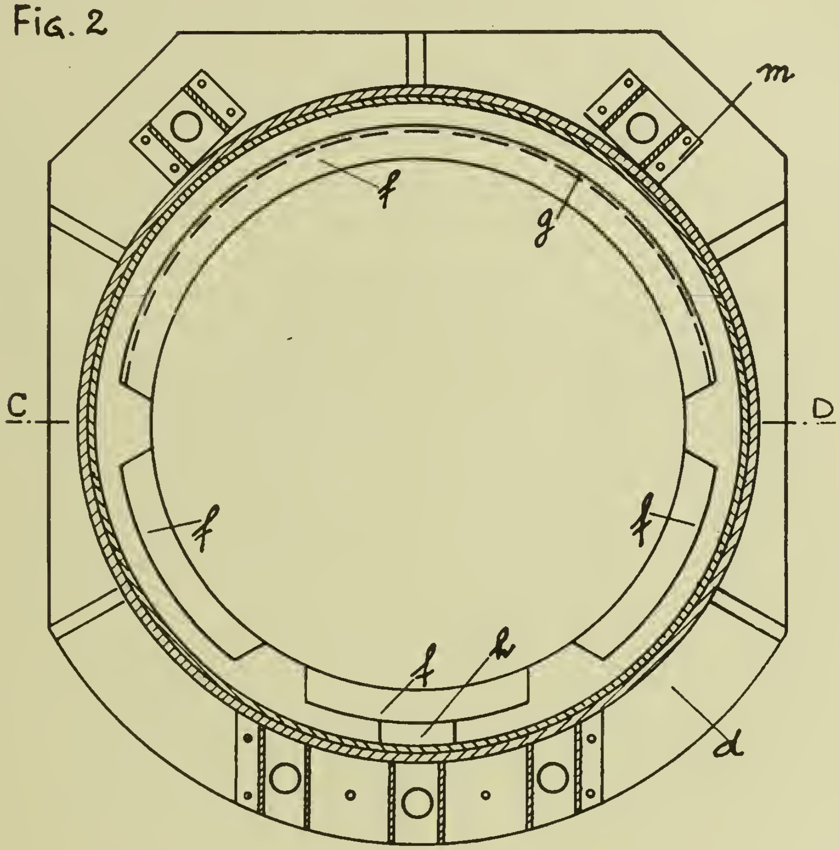
BY A. P. C.

G. STROMEIER
ARRANGEMENT FOR PREVENTING THE ESCAPE OF OIL
FROM THE AXLE BOXES OF RAILWAY VEHICLES
Filed Jan. 14, 1941

Serial No.
374,404

3 Sheets-Sheet 2

Fig. 2



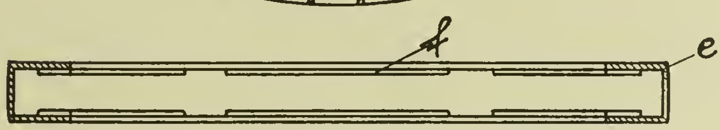


Fig. 3

Inventor:
G. Stromeier

By: Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

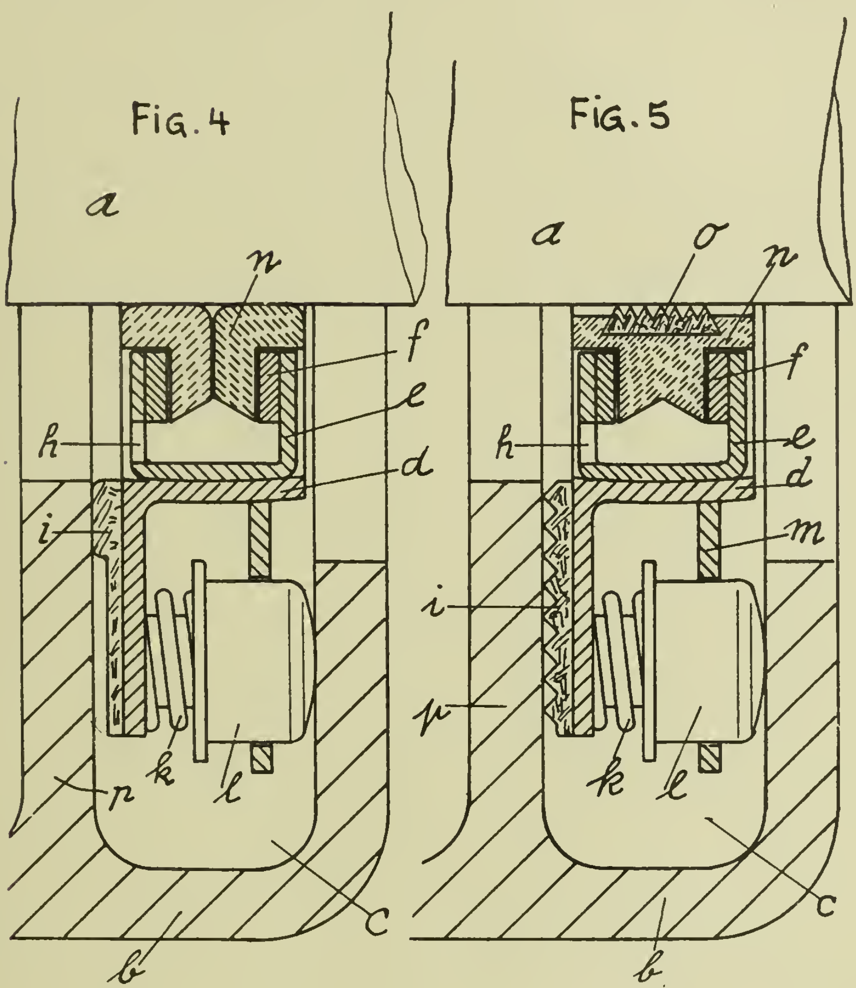
G. STROMEIER

ARRANGEMENT FOR PREVENTING THE ESCAPE OF OIL FROM THE AXLE BOXES OF RAILWAY VEHICLES

Filed Jan. 14, 1941

Serial No. 374,404

3 Sheets-Sheet 3



Inventor:
G. Stromeier
By: Glascock Downing & Seebold
Attys

Published May 25, 1943

Serial No. 374,460

ALIEN PROPERTY CUSTODIAN

CATHODE RAY TUBE

Hanns-Heinz Wolff, Berlin, Germany; vested in the Alien Property Custodian

Application filed January 15, 1941

The present invention relates to cathode ray tubes in which means are provided for modulating the intensity of the stream between the cathode and an intercepting electrode (collecting plate) by deflection control with the aid of a cutting-off arrangement. Tubes and systems of this kind can be used as switching devices, so-called cathode ray relays, more particularly electron ray relays, and have been already described in the copending patent applications Ser. No. 96,582 (filed August 18th, 1936) and Ser. No. 112,488 (filed November 24th, 1936).

In employing such tubes one often desires to obtain the highest possible voltage impulses from the device. For this purpose one can connect the one of the taps for the impulses with the collecting plate, the other with the cutting-off diaphragm and insert a resistance between the two electrodes. If the diaphragm is provided with a fixed high potential, for example is connected with the anode of the focussing system or, in a given case, is used itself as an anode, a very high drop of potential occurs at the resistance connected between the diaphragm and the collecting plate. This drop of potential can assume such values that the greater, or at least a considerable part of the electrons which have passed through the diaphragm does not reach the collecting plate but is rejected and returns to the diaphragm. It is evident that by the way the obtainable amount of the voltage impulses is greatly limited.

The difficulty in question can be avoided by giving the collecting plate the highest positive potential which preferably is so much higher than the potential of the diaphragm as is required by the amount of the desired voltage impulse.

The advantage of the just mentioned arrangement, however, is partly compensated by the increased voltage requirement of the device, because voltage supplies must be provided which are able to furnish higher potentials than are required for operating the relay or the tube by itself. Further there is the danger that variations of the potential of the diaphragm cause considerable distortions of the field in front of the diaphragm and that thereby the precise control of the relay is questioned.

It is an object of the present invention to provide arrangements and circuits in and for cathode ray tubes of the above mentioned type which make it possible to avoid the disadvantages of the known arrangements.

According to one feature of the invention, between the diaphragm and the collecting plate there is provided an auxiliary electrode which is so dimensioned, shaped, and biassed, that practically all of the electrons which have passed through the diaphragm reach the collecting plate. The auxiliary electrode prevents that a considerable part of the electrons returns to the diaphragm.

The invention will be better understood with the aid of and further features of the invention will be apparent from the following more detailed description and the accompanying drawing of which, in a purely diagrammatic fashion and by way of example:

Fig. 1 illustrates an embodiment of the complete relay and some essential elements of the circuits connected thereto, while

Figs. 2–4 show various embodiments of the arrangement comprising the cut-off diaphragm, the auxiliary electrode, and the collecting plate.

In Fig. 1 the reference numeral 1 designates the tube vessel which contains the incandescent cathode 2 and an electron-optical focussing system consisting, for example, of the Wehnelt cylinder 3 and the electrodes 4, 5, and 6. Element 6 is the main anode above referred to of the focussing system. Moreover, the figure shows two pairs 7 and 8 of deflecting plates mounted within the tube.

It may be noted that for a certain range of applications only means for deflecting the beam in one direction are required.

The tube further contains the cut-off diaphragm 9 and the collecting plate 10. The auxiliary electrode 11, provided according to the invention, is mounted between the electrodes 9 and 10 and preferably in the closest possible vicinity of electrode 9. The auxiliary electrode is also given the form of a diaphragm. The shape of its aperture corresponds to the aperture of the cut-off diaphragm and is homologous to the latter. Preferably the aperture of diaphragm 11 is somewhat larger than the aperture of diaphragm 9 so that the field produced by the auxiliary electrode 11 does not noticeably penetrate into or through the aperture of 9.

The incandescent cathode 2 is heated by means of a current source 12. The potentials required for operating the tube are furnished by the voltage supply 13 which at the same time provides for the biassing potentials of the several tube electrodes. The electrode 10, the variations of potential of which are to be utilised, is connected via a resistance 14 to the diaphragm 9. The voltage impulses preferably are tapped at the dia-

phragm 9 and the plate 10 or at the cathode 2 and the plate 10.

The potential of the auxiliary electrode 11 is so chosen that, if possible, it is lower than the lowest potential which the electrode 10 is desired to assume in operation. In the example illustrated by Fig. 1, the auxiliary electrode is connected to the potential of the cathode, but in a given case it may be suitable to select the potential of the diaphragm 11 higher or lower than the cathode potential.

The electron-optical system is so designed and the potentials of its electrodes are so adjusted that the electron ray is focussed as sharply as possible in the plane of the boundary of the aperture of the diaphragm 9. For example, the focussing system may be so dimensioned as to concentrate the beam in a cross-over point situated in the aperture of the cut-off diaphragm. The potential of the diaphragm 9 is made equal to anode potential and preferably even somewhat higher. This is indicated by the elements shown in dotted lines of battery 13 in Fig. 1.

Of course, the electrostatic electron-optical system shown in the drawing can be replaced by an electromagnetic system or by combined electrostatic and electromagnetic systems. It is also possible to employ a magnetic deflecting system or, when the beam is to be deflected in two directions, combined electrostatic and electromagnetic deflecting means instead of the electrostatic deflecting system of Fig. 1. Also an intensity control grid may be additionally provided in certain cases.

The field produced by the electron-optical focussing system and correspondingly the shape of the electrodes or at least of the apertures of the electrodes of the electron-optical system need not be of rotational symmetry. Instead of spherical electron-optical lenses, for example, electron-optical cylinder lenses can be used and preferably combined with a corresponding form of the emissive surface of the cathode.

In Figs. 2–4 several embodiments of the electrodes 9, 10 and 11 are illustrated.

Fig. 2 shows a diaphragm 9 provided with a tubular abutment 15 which projects into the aperture of the auxiliary electrode 11.

Figs. 3 and 4 show diaphragms and auxiliary electrodes, the rims of which are bent over in order to avoid as far as possible the danger of breakdown between electrodes which have a high potential difference with respect to one another. In such cases the leads to the electrodes preferably are fixed at the inner sides of the bent parts of the diaphragms or at least at the inner sides facing away from one another of the electrodes.

Various shapes depending on the actual requirements can be given to the aperture of the diaphragm 9, for example the electrodes can be made circular, slit-shaped, triangular or of still other form.

HANNS-HEINZ WOLFF.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

HANNS-HEINZ WOLFF
CATHODE RAY TUBE
Filed Jan. 15, 1941

Serial No.
374,460

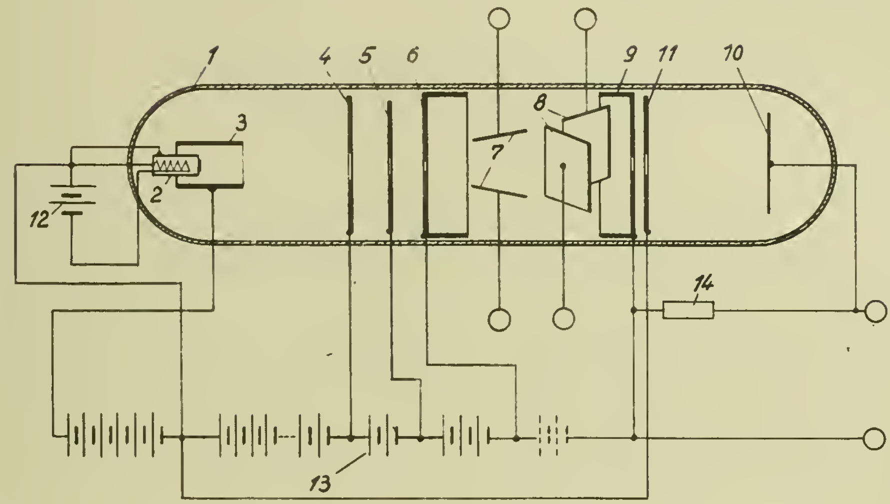


Fig. 1

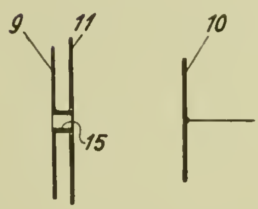


Fig. 2

Fig. 3

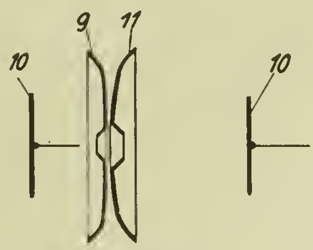


Fig. 4

Inventor:
Hanns-Heinz Wolff

Published May 25, 1943

Serial No. 374,461

ALIEN PROPERTY CUSTODIAN

ELECTRICAL LIGHT IMPULSE GENERATOR

Hanns-Heinz Wolff, Berlin, Germany; vested in the Alien Property Custodian

Application filed January 15, 1941

The present invention relates to means for photographical reproduction of very rapid occurrences. For these purposes the object which shall be observed is lighted by a large number of light pulses in such a manner that said occurrence is reproduced by a fixed or moved film at different times. It has been already proposed for producing said light pulses to use an electrical generator producing pulses of a variable frequency and a cathode ray tube operating as a light source.

The present invention relates to generators of the described type.

The known embodiments of the generator of the type described hereinbefore have disadvantages consisting in that for using a large number of pulses per second the light of the pulses is insufficient. Even if the best optics and the most sensible films are used the light of the generator cannot expose perfectly the film. A further disadvantage consists in distorting the reproduction in the case of using a low frequency of light pulses and reproducing a rapid occurrence.

According to the present invention means for adjusting the frequency and the duration of the light pulses are provided. For these purposes arrangements are used by which short electrical impulses of adjustable times may be produced from a given control voltage.

Methods for producing short impulses from a sinusoidal control voltage have been already proposed which impulses have times being independent of the amplitudes of the control voltage.

E. g. it is possible to use an arrangement containing an electron valve with two homogeneous control grids being arranged one after another. This valve is connected by its anode and cathode in a circuit of a d. c. source. The control voltage is applied to both control grids in nearly reverse phase. The difference of the shifted phases from 180 degrees on both control grids corresponds to the required impulse duration.

According to a further object of the invention a cathode ray tube may be employed as a generator for producing short adjustable impulses. Such a cathode ray tube contains a separate electrode. The cathode ray strikes this electrode if it passes a diaphragm being arranged between the anode and said electrode. By the control voltage the cathode ray is moved over the diaphragm in the ryhthm of the frequency of the control voltage. Thereby an impulse arises in the circuit of said electrode. The diaphragm may have a triangular aperture. The interruption of the cathode ray is the smaller the larger is the distance of the ray from the top of the triangle.

In Fig. 1 an embodiment of the invention is shown. An oscillator consisting of a tube 1, a coil 2 and a variable condenser 3 produces a control frequency which may be adjusted by tuning the condenser. Via the coil 4 the coil 2 is coupled to the tube 5 operating as an impulse generator. The ends of the coil 4 are connected to the control grids of the tube 5 each. The middle point of the coil 4 is connected to the cathode. A phase shifting arrangement consisting of the resistance 6 and the condenser 7 is used for adjusting the phase displacement of more or less than 180 degrees.

A variation of the phase displacement e. g. by a variation of the capacity of the condenser 7 causes a variation of the duration of light impulse.

The cathode ray tube 8 is the light source the intensity control electrode of which is connected to the output of the tube 5. The main supply apparatus 9 consists of two parts one of which supplies the low voltages for the impulse generator, the other supplies the high voltages for the cathode ray tube. The cathode ray tube 8 may have a fluorescence screen operating as an accelerating electrode.

Figure 2 shows a further embodiment of the invention containing an impulse generator being a cathode ray tube and an oscillator 1, 2, 3 being tuned to the frequency of the light impulses. The cathode ray tube 9 contains a triangular diaphragm 10 as shown in Fig. 2*a* after which an electrode 11 as shown in Fig. 2*b* is arranged. The oscillator 1, 2, 3 is connected to a pair of deflecting plates 12 of the cathode ray tube 8. Another pair of deflecting plates 13 is connected to a direct voltage which deflects the cathode ray in the direction of the top of the triangle diaphragm. By variation of the tap on the potentiometer 14 the cathode ray is deflected to pass the triangle diaphragm 10 distant by more or less from the top. The impulses produced at the electrode 1 are use to control the light impulses.

If the optics, the sensibility of the film, and the intensity of light are given the most suitable duration of the light impulses is different for each frequency of the light impulses. Therefore according to a further object of the invention the variation of duration of light impulse should be dependent on the variation of the frequency of the light impulses. For these purposes the circuit elements determining the frequency and the duration of impulses are coupled in mechanical

manner each to other. These elements may be arranged on a common axis in such a manner that the most suitable duration is given simultaneously for each frequency.

According to a further object of the invention the coupling between these elements is made to be adjustable. For this purpose the axis of the rotatable condensers 3 and 7 according to the Fig. 1 or the axis of the rotatable condenser 3 and of the potentiometer according to the Fig. 2 are arranged concentrically each to other in such a manner that the handles of the two elements are coupled each to other by friction. By a separable coupling it is possible to adjust the both handles independently each from other. The one of the handles may have a marked line the other a scale giving the product of the intensity of the optics and the film, and of the clearness of the light source. By this way it is possible to adjust the handles to the best position each to other for each light impulse frequency. Naturally the rotatable condensers 3 and 7 respectively the condenser 3 and the potentiometer 14 shall be so tuned that the each equal angle of rotation of the element determining the impulse frequency and of the element determining the duration of impulses corresponds to the best light impulse duration.

The Figs. 3 and 4 show embodiments of a separable coupling of the rotatable condensers 3 and 7 respectively of the condenser 3 and the potentiometer 14. In Fig. 3 the condensers 3 and 7 are fixed on differently but concentrically each to other arranged axes. Both axes are coupled by friction by springs 15 being fixed on the external or internal axis. A further friction arrangement 16 is provided between the external axis and the stator of regulation arrangement. The friction of the arrangement 16 must be more strong than the friction of the springs 15.

If the handle 17 being arranged on the external axis is rotated the friction of the arrangement 16 is overcome. The internal axis is rotated by the arrangement 15. But if the handle 18 is moved, only the internal axis is connected to the handle 18 and rotated upon the reason of the more strong friction by the arrangement 16 than by the springs 15. The external axis is arrested by the arrangement 16.

According to a further arrangement of the invention means for a total uncoupling of both regulating elements are provided. That may be caused by a spring which looses the coupling by shifting.

In the embodiment according to Fig. 2 instead of the rotatable condenser 7 upon the internal a potentiometer 14 is used as shown in Fig. 4.

HANNS-HEINZ WOLFF

PUBLISHED
MAY 25, 1943.
BY A. P. C.

HANNS-HEINZ WOLFF
ELECTRICAL LIGHT IMPULSE GENERATOR
Filed Jan. 15, 1941

Serial No.
374,461

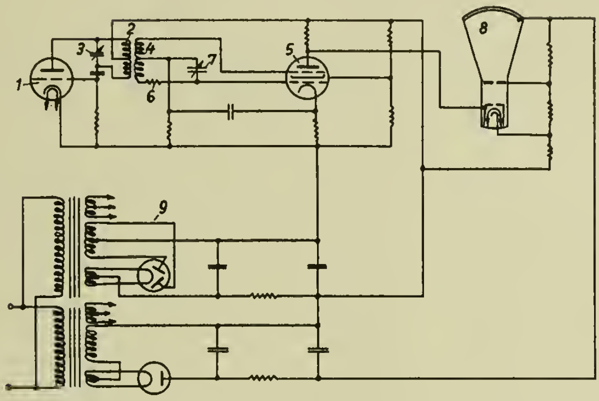


Fig.1

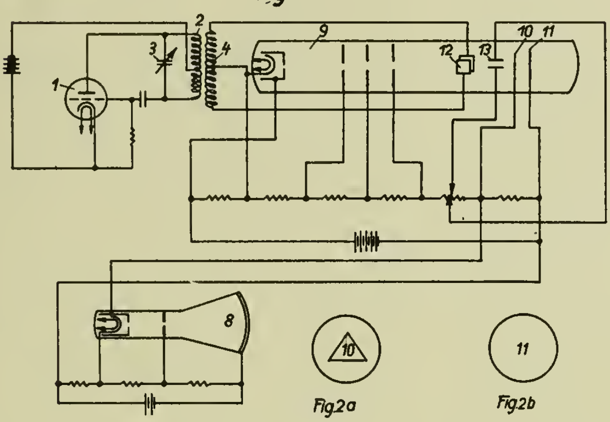


Fig2a

Fig2b

Fig.2

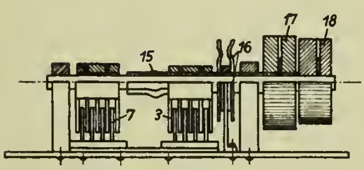


Fig.3

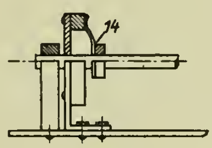


Fig.4

Inventor

Published May 25, 1943

Serial No. 374,712

ALIEN PROPERTY CUSTODIAN

CIRCUIT FOR THE TRANSMISSION OF ELECTRICAL OSCILLATIONS

Maximiliaan Julius Otto Strutt, Aldert van der Ziel, and Cornelis Jan Bakker, Eindhoven, Holland; vested in the Alien Property Custodian

Application filed January 16, 1941

This invention relates to a circuit arrangement for the transmission of electrical oscillations which comprises at least one controlled discharge tube, and has for its purpose to provide means whereby the noise occurring in such circuits can be avoided.

This noise, which is particularly troublesome in the transmission of weak signals, is partly brought about by discharge tubes present in the circuit and partly by the other circuit elements and it may therefore be distinguished in tube noise and circuit noise.

The circuit noise is brought about by spontaneous voltage fluctuations which occur at the ends of each conductor due to thermal propagation of the electrons, and this the stronger according as the conductor concerned has a higher ohmic resistance. Thus, such a noise voltage which is usually referred to as "circuit noise" is set up, for example, across an oscillatory circuit included in the input circuit of a high-frequency amplifying tube.

The tube noise may be distinguished in emission noise and distribution noise. The emission noise is composed of fluctuations of the emission of a cathode, which cathode may be either a thermionic cathode or a secondary-emitting auxiliary cathode or a photo-cathode. The distribution noise is brought about by fluctuations of the current distribution in tubes having more than one positive electrode and consequently occurs, for example, in screen-grid tubes and multi-grid mixing tubes.

The noise generally forms a continuous frequency spectrum, of which only that portion is troublesome which is transmitted by the circuit arrangement. In low-frequency amplifiers trouble is encountered from particular emission noise which is referred to as "flicker" and which is produced due to several parts of the cathode being in turn emissive. This is a cathode noise which is mainly composed of low-frequency components.

It has already been endeavoured to reduce the tube noise by means of special tube constructions. Thus, for example, in screen-grid tubes the distribution noise may be reduced either by limitation of the screen-grid current or by such a geometric arrangement of the electrodes that the emission from definite parts of the cathode contributes exclusively to the screen-grid current and that of other parts contributes exclusively to the anode current.

The present invention provides means whereby the tube noise may be greatly reduced without utilising special tube constructions while in some cases also an improvement in the circuit noise is obtained.

According to the invention, the circuit of an electrode to which flows a noise current has taken from it a noise voltage which is correlated with the said current and which controls the output current of the tube in such phase that the noise current produced in the output circuit is reduced and/or the ratio between the signal current and the noise current in the output circuit is increased.

To this effect, an impedance is preferably included in the circuit of an electrode to which flows a noise current, the noise voltage set up across this impedance being supplied in the required phase to a control grid of the tube by means of a second impedance. It is advantageous to choose these impedances so as to contain but small ohmic resistances since otherwise a new source of noise would be introduced.

Another possibility is that the circuit of an electrode to which flows a noise current is coupled by means of a transformer to a control-grid circuit of the tube. In mixing circuits a decrease of the distribution noise may thus be obtained, for example, by including a coil in the circuit of at least one of the screen-grids and by coupling this coil inductively with an oscillatory circuit tuned to the intermediate frequency and included in one of the control-grid circuits.

Finally, for the desired control of the output current, use may alternatively be made, in particular for very high frequencies, of the voltage drop which occurs across an impedance included in the circuit of a control grid due to the influence current which flows to the said control grid.

In order that the invention may be more clearly understood and readily carried into effect it will be described more fully by reference to the accompanying drawings showing several practical embodiments thereof, wherein Fig. 1 represents an amplifying circuit utilising means for decreasing the noise current in the output circuit which is correlated with the cathode noise. Fig. 2 is a vector diagram serving to explain a certain phenomena occurring in the operation of Fig. 1. Fig. 3 shows curves serving to explain the operation of the circuit of Fig. 1 in a superheterodyne receiver. Figs. 4 and 5 are modifications of the invention as applied to secondary-emission tubes. Figs. 6 and 7 disclose respectively an amplifying and a mixing circuit for decreasing the distribution noise. Fig. 8 shows a low-frequency amplifying circuit for decreasing the distribution noise. Fig. 9 shows a high-frequency amplifier utilizing a secondary-emission tube with means for reducing simultaneously all the noise components, and Fig. 10 is a diagram of curves for explaining the operation of the several circuits in respect of noise decreasing. For the case of simplicity the sources of direct voltage have been omitted from the figures.

Referring now to Fig. 1 an oscillatory circuit 1 which is tuned to the signal to be amplified is

included in the control-grid circuit of an amplifying tube 2. The anode circuit comprises an oscillatory circuit 3 which is tuned to the same frequency and from which is derived the amplified voltage. According to the invention that part of the cathode lead which is common to the control-grid circuit and the anode circuit comprises a self-induction coil 4. A noise voltage occurs across this coil which is correlated with the cathode noise and leads 90° relatively to the cathode-noise current. This noise voltage brings about a current through the capacity 5 between the control grid and the cathode (which is represented in dotted lines in the figure) which current leads 90° relatively to the voltage across the coil 4 and is consequently in anti-phase with the cathode noise-current. For those frequencies of the noise spectrum which are transmitted by the arrangment the circuit 1 practically constitutes an ohmic resistance so that for these frequencies a noise voltage is set up across the circuit 1 which is in anti-phase with the cathode noise-current. This noise voltage also occurs at the control grid of the tube 2 and thus gives rise to an additional anode current which is in anti-phase with the cathode noise current so that the noise current in the anode circuit which is correlated with the cathode noise is decreased.

In order to obtain the desired effect it is not essential that an inductance should be present in the cathode lead and a capacity between the control grid and the cathode. It is alternatively possible, for example, to provide a capacity in the cathode lead and an inductance between control grid and cathode. The embodiment shown in the figure is, however, the most practical one since the capacity between control grid and cathode is naturally present. On principle use may be made of any combination of impedances which brings about a noise voltage across the circuit 1 which is in anti-phase with the cathode noise-current. It is, however, advantageous to use impedances containing but low ohmic resistances since otherwise new sources of noise would be introduced.

The magnitude of the noise voltage set up across the circuit 1 is determined by the product of the capacity 5 and the inductance of the coil 4. Consequently, the decrease of the noise current in the anode circuit which is correlated with the cathode noise is greater according as the capacity 5 (if desired by means of parallel connection of an additional condenser) and the inductance of the coil 4 are chosen of a higher value.

In this connection it must be borne in mind, however, that not only a noise voltage but also a signal voltage is set up across the coil 4 so that the input circuit has also supplied to it a signal current which is in anti-phase with the signal voltage set up across the said circuit; in other words the presence of the coil 4 brings about an additional damping of the circuit 1 and consequently the suppression of the cathode noise cannot be continued to a further extent than is admissible in view of the additional damping involved.

The said additional damping brings about a decrease of the signal voltage set up across the input circuit, which results in the signal current in the output circuit being reduced to the same degree as the noise current correlated with the cathode noise.

Consequently, the ratio between signal and noise which occurs in the output circuit remains constant when using the measure described, in other words the invention provides here a means of damping the input circuit without the signal to and noise ratio being decreased thereby.

It appears therefrom that it is no use utilising the circuit arangement of fig. 1 in those cases in which the damping of the input circuit is desired to be as small as possible but that important advantages are obtained in all those cases in which particular reasons render a greater damping of the input circuit desirable than that which is brought about by the unavoidable losses of the circuit.

Thus, the described circuit is, for example, of great importance for amplifying circuit arrangements transmitting a very wide frequency band, such as are used inter alia in television receivers, since in general in such amplifiers an additional damping of the input circuit is always necessary for obtaining the desired wide transmission range. This additional damping was hitherto obtained either by admitting greater losses in the circuit, or by connecting an ohmic resistance in parallel with the circuit. These usual measures reduce the signal voltage set up across the circuit, whereas the tube noise remains equal so that the ratio between the signal and the tube noise is reduced while in addition in most cases the ratio between the signal voltage set up across the circuit and the circuit noise voltage is reduced. If, on the other hand, the required additional damping according to the invention is obtained by means of an inductance in the cathode lead the ratio between the signal and the tube noise remains constant while in additional a new source of noise is not introduced in the circuit so that also the ratio between the signal voltage set up across the circuit and the circuit noise voltage remains constant. Consequently, both the tube noise and the circuit noise are in this case reduced relatively to the usual circuits, i. e. with a circuit damped with any desired intensity we obtain the same signal to noise ratio as can be obtained with a circuit of very good quality. A maximum freedom of noise is obtained if the damping of the input circuit that is required in connection with the desired transmission range is brought about almost exclusively by the self-induction coil in the cathode lead. The inductance required therefor is in a television receiver of the order of magnitude of 0.1 microhenrys.

Another case in which an additional damping of the oscillatory input circuit may be advantageous, and this independently of the required transmission range, occurs with amplifiers for very high frequencies in connection with the so-called "transit-time noise" which phenomenon will be explained hereinafter.

If the transit-time of the electrons between cathode and anode is no longer negligibly small relatively to the period of the oscillations to be transmitted an influence current to the control grid occurs, as can be readily appreciated with reference to the vector diagram represented in Fig. 2. The diagram applies to a triode: in multi-grid tubes, however, substantially equal phenomena occur. In the figure V_g represents the control-grid alternating voltage. Due to the finite transit time of the electrons between control grid and cathode, the cathode alternating current I_k lags a little relatively to the control-grid alternating voltage. The anode cur-

rent I_a, if at least the transit time of the electrons between control grid and anode is not greater than half a period of the oscillations to be amplified, is according to its absolute value approximately equal to I_k but shows a greater lag relatively to the alternating voltage of the control-grid. The current I_g which constitutes the geometric difference between the currents I_a and I_k must have flowed to the control grid. The influence current I_g flowing to the control grid contains a component which leads 90° relatively to the control-grid alternating voltage and which can be regarded as a result of an apparent increase of the capacity between control grid and cathode, and a component which is in phase with the control-grid alternating voltage and gives rise to the so-called "transit-time damping." The current I_g contains a noise component which is correlated with the cathode noise and which brings about a noise voltage across the input circuit which is displaced in phase relatively to the cathode-noise-current and gives rise to a material increase of the noise current in the anode circuit which is correlated with the cathode noise. This additional noise current may be referred to as "transit-time noise."

For completeness' sake we may mention that the phenomena which actually occur are more complicated than would appear from the above-mentioned considerations, and this because the speed of the electrons between control grid and cathode is dependent on the instantaneous value of the control-grid voltage. The resulting variations in speed of the electrons give rise to an additional influence current which contributes to the apparent increase of the control grid-cathode capacity and to the "transit-time damping" but does not contain a noise component and consequently does not contribute to the "transit-time noise."

The "transit-time damping" may be interpreted as an apparent resistance connected in parallel with the input circuit and the "transit-time noise" may be regarded as spontaneous voltage fluctuations in this resistance. From this consideration it appears that the said resistance behaves like an ohmic resistance which is approximately at cathode temperature and consequently causes a considerably stronger noise than an ohmic resistance of the same value at room temperature. It is therefore of importance to see to it that the damping of the oscillatory input circuit is not mainly determined by the "transit-time damping", which at a given value of the "transit-time damping" can only be obtained by strong damping of the input circuit in a different manner. This measure, however, is of some use only in the case wherein the increased damping of the input circuit does not in itself decrease the signal to noise ratio. Here use may advantageously be made of the circuit of Fig. 1 in which an increase of damping is obtained without a decrease of the signal to noise ratio.

In the amplification of ultra-short waves ($\lambda<3$ m) the above-mentioned considerations lead to the use of tubes which are different from those hitherto used for the amplifications of these waves. One has always taken the view that for a reasonable noiseless amplification the total impedance of the oscillatory input circuit must be higher than the equivalent noise resistance of the tube. The equivalent noise resistance which is a measure of the intensity of the tube noise may be defined as an ohmic resistance which, upon being included in the control-grid circuit of an entirely noiseless tube of the same type, would bring about in the anode circuit a noise current which is equal to the noise current which actually occurs in the anode circuit and which is correlated with the tube noise. On the ground of the above-described rule use has always been made so far of tubes having a minimum possible input damping. With ultra-high frequencies the natural inductance of the cathode lead already brings about a material damping of the oscillatory input circuit, which damping together with the "transit-time damping" practically determines the total impedance of the input circuit. For these ultra-high frequencies therefore use has been made of the so-called "button tubes" in which, due to small dimensions and a small mutual conductance, the damping of the input circuit brought about by the natural inductance of the cathode lead is limited to a minimum. Now, the above-mentioned considerations demonstrate that the damping brought about by the self-induction of the cathode lead does not influence the signal to noise ratio the while in view of the "transit-time noise" it may even be advantageous that this damping is not too weak. Consequently, instead of using the usual "button tubes", use may advantageously be made of other tubes whose dimensions and mutual conductance are chosen such that the natural inductance of the cathode lead brings about a material decrease of the noise current in the output circuit which is correlated with the cathode noise, provided that care is taken to see that the total damping of the input circuit decrease by the damping brought about by the natural inductance of the cathode lead is smaller (for example at least twice smaller) than the reciprocal value of the equivalent noise resistance. When choosing the ratio between the total impedance of the input circuit and the equivalent noise resistance the damping of the input circuit brought about by the inductance of the cathode lead has therefore to be disregarded. In practice this leads to the use of tubes of larger dimensions and/or higher mutual conductance than the "button tubes" while tubes having a space-charge grid between cathode and control grid may be used with particular advantage since in these tubes the "transit-time damping" may be negative and the above-stated prescription may consequently be easily fulfilled. In addition, such tubes permit an adjustment for the electrode biasing voltages in which no influence noise current flows to the control grid so that "transit-time noise" does not occur. Of course, care must always be taken to see that the mutual conductance is sufficiently high to ensure sufficient amplification in spite of the greater damping of the input circuit.

It is known that the "transit-time damping" may be eliminated by including a resistance, which is not bypassed for high frequency currents, in the cathode lead of the tube. It appears that due to the connection of such a resistance in the cathode lead the "transit-time noise" also may be completely compensated. In connection with the complication already mentioned which is brought about by the variations in speed of the electrons between cathode and control grid a higher resistance is necessary for compensating the "transit-time noise" than that which is required for compensating the "transit-time damping." The effect of the compensation of the "transit-time noise" obtained in this manner is, however, decreased due to the resistance included

in the cathode lead on the one hand constituting a new source of noise and on the other hand decreasing the effective mutual conductance of the tube due to the fact that a negative feedback is brought about.

In circuit arrangements for the transmission of oscillations of very high frequencies in which the transmission range of the input circuit is considerably wider than the transmission range of the whole circuit efficient use may be made for compensating the cathode noise of the noise voltage which occurs across the input circuit due to the above-mentioned influence phenomena. As appears from Fig. 2, the influence current flowing to the control grid leads almost 90° in phase relatively to the cathode current. Now, by slightly detuning the input circuit relatively to the signal to be transmitted it may be achieved that for those frequencies of the noise spectrum which fall within the transmission range of the circuit the input circuit behaves like a small capacity so that for these frequencies a noise voltage occurs across the input circuit which is in anti-phase with the cathode noise-current. This noise voltage gives rise to an additional anode current which is in anti-phase with the cathode noise-current so that the total noise current in the anode circuit which is correlated with the cathode noise is decreased and may even be reduced to nought. A further explanation thereof will be given with reference to Fig. 3 in which curve 6 represents the resonance curve of the input circuit, whereas curve 7 represents the materially narrower transmission range of the circuit which is determined by the following stages of the circuit, in a superheterodyne receiver, for example, mainly determined by the intermediate-frequency amplifier. As appears from the figure, the resonance frequency ω_0 of the input circuit has been chosen to be slightly lower than the signal frequency ω_s falling within the transmission range so that the input circuit behaves for the signal frequency as a small capacity. The amplification of the signal is but slightly impaired by the detuning of the input circuit since the transmission range of the input circuit is much larger than the required transmission range. A troublesome distortion of the signal, which may occur due to the detuning, may be compensated by a similar detuning in opposite sense in one of the following stages in which the signal has already been amplified to such extent that the noise no longer plays a part.

The fact that the influence current flowing to the control grid is not exactly shifted in phase by 90° relatively to the cathode current may be taken into account by choosing the damping of the input circuit (including the "transit-time damping") of such value that the noise voltage set up at the control grid has exactly the phase required for the compensation. In practice the complete compensation of the cathode noise requires such a detuning of the input circuit as to represent a capacity of a few micro-microfarads, for example 2 to 3 micro-microfarads.

In the circuit described the cathode noise and the "transit-time noise" neutralise one another while practically the signal intensity is not decreased. It is evident that consequently a very effective decrease in noise is achieved. The circuit concerned has, however, the disadvantage that the simultaneous decrease of noise currents which originate from other noise sources (distribution noise and secondary-emission noise, if any) involves some difficulty, as will hereinafter be set out more fully. Besides, this method of noise compensation is less suitable in circuits which have to transmit a wide frequency-band such as, for example, in television receivers since in this case curve 7 of Fig. 3 will generally have approximately the same width as curve 6 so that a detuning of the input circuit relatively to the frequency to be transmitted is practically no longer possible.

In the various circuits described above the noise voltage required for decreasing the cathode noise was derived either from the cathode circuit or from the control-grid circuit. For completeness' sake it may be remarked that the current of screen grids which may be available in the tube, the anode current and the current of secondary-emission electrodes, if any, as well as the influence currents flowing to any further grids with negative bias contain all of them a noise component which is correlated with the cathode noise so that on principle a noise voltage may be derived from the circuits of any of these electrodes, which voltage may be used for decreasing the cathode noise. Furthermore, the control of the output current by the said noise voltage, due to which the said decrease in noise is achieved, need not take place by supplying this noise voltage to the input control grid, but for this purpose use may alternatively be made of another control grid.

A decrease of the above-mentioned "flicker" in low-frequency amplifiers may be achieved in a similar manner as a decrease of the normal cathode noise, that is to say, for example, by deriving a voltage correlated with the "flicker" from an impedance included in the cathode lead and by supplying this voltage in suitable phase to the control grid. The circuit of Fig. 1 is less suitable for this purpose since the inductance in the cathode lead required in this case would have too high a value. In the case described use will preferably be made of a transformer for supplying the "flicker" voltage to the control grid.

Fig. 4 shows an amplifying circuit having a secondary emission tube and comprising means for decreasing the secondary-emission noise. This is effected in a similar manner as decreasing of the cathode noise in the circuit arrangement of Fig. 1, viz. by connecting a self-induction coil 8 in the circuit of the secondary-emission electrode, a noise voltage correlated with the secondary-emission noise occurring across the said coil and being supplied through a condenser 9 to the control grid in such phase that the noise current in the anode circuit which is correlated with the secondary-emission noise is decreased. The natural capacity between the secondary-emission electrode and the control grid is generally too low for this purpose so that a condenser must be interposed between the secondary-emission electrode and the control grid.

In the circuit arrangement of Fig. 4, as in the circuit arrangement of Fig. 1, an additional damping of the input circuit 1 is brought about, resulting in a decrease not only of the noise current but also of the signal current. However, while in the circuit arrangement of Fig. 1 the signal to noise ratio remained constant, the signal to noise ratio will in this case increase, according as the noise current is decreased. On principle the secondary-emission noise therefore may be completely suppressed. This is due to the fact that the noise currents in the anode circuit and in the circuit of the secondary-emission electrode, which noise currents are corre-

lated with the secondary-emission noise, are equal to one another, whereas the signal currents in the two circuits are different. Consequently, the ratio between the signal and the secondary-emission noise is different in the two circuits so that in the case of complete suppression of the secondary-emission noise a signal remains all the same. On the other hand, the ratio between the signal and the cathode noise in the anode circuit is equal to that in the cathode circuit so that in the case of complete suppression of the cathode noise by means of the circuit arrangement of Fig. 1 the signal would also disappear.

In the case of complete suppression of the secondary-emission noise the amplification in the circuit arrangement of Fig. 4 is decreased exactly to such extent that the anode current is equal to the current which would be obtained if the tube did not comprise a secondary-emission electrode. In this case therefore use may as well be made of a tube without secondary emission. Partial suppression of the secondary-emission noise with the aid of the circuit arrangement of Fig. 4 is, however, advantageous in all those cases in which greater amplification is desired than that which can be obtained without secondary emission while the maximum amplification which may be obtained with a secondary-emission tube is not required.

In addition, the circuit arrangement of Fig. 4, like that of Fig. 1, provides the possibility of increasing the damping of the input circuit without a decrease of the signal to noise ratio. Consequently, the use of the circuit concerned offers advantages in all those cases wherein for particular reasons a greater damping of the input circuit is desired than that brought about by the unavoidable losses of this circuit.

Another method of decreasing the secondary-emission noise is illustrated in Fig. 5 in which the output circuit **3** is included in the circuit of the secondary-emission electrode while the anode circuit comprises a condenser **10** across which occurs a noise voltage which is correlated with the secondary-emission noise. This noise voltage is supplied in the desired phase to the control grid through a condenser **11**. Instead of an inductance, as in the circuit arrangement of Fig. 4, in this case a condenser **10** must be provided in the anode circuit for decreasing the secondary-emission noise since the phase of the secondary-emission noise in the anode circuit is opposite to that in the circuit of the secondary-emission electrode. Complete suppression of the secondary-emission noise as is possible in the circuit arrangement of Fig. 4, cannot be achieved in the circuit arrangement of Fig. 5. The latter, however offers the advantage that the decrease in noise is not dependent on the signal frequency, which is the case in the circuit arrangement of Fig. 4.

It may be mentioned that in the circuit arrangements of Figs. 4 and 5 the cathode noise is also decreased since the current of the secondary-emission electrode and the anode current both comprise a noise component which is correlated with the cathode noise.

With tubes having more than one secondary-emission electrode it must be considered that each of the secondary-emission electrodes constitutes an independent source of noise. The current of the last secondary-emission electrode and the anode current also comprise a noise component which is correlated with the noise of the preceding secondary-emission electrodes so that the total secondary-emission noise may be decreased by means of a noise voltage derived from the anode circuit or from the circuit of the last secondary-emission electrode. It is also possible to decrease the noise of each secondary-emission electrode separately in the manner as illustrated in Fig. 4.

The secondary-emission noise may also be decreased by arranging for a noise voltage correlated with the secondary-emission noise to be fed back to another control grid instead of to the input control grid.

Fig. 6 shows a circuit arrangement comprising means for suppressing the distribution noise. This figure illustrates an amplifying circuit utilizing a screen grid tube and in which the distribution noise is produced by fluctuations in the current distribution between screen grid and anode. The screen-grid circuit comprises an inductance **12** across which occurs a noise voltage correlated with the distribution noise. This noise voltage is supplied to the control grid through the screen grid- control-grid capacity **13** which is shown in dotted lines, in such phase that the noise current in the anode circuit which is correlated with the distribution noise is decreased. While in the above-described circuits an additional damping of the input circuit was always brought about when decreasing the emission noise, the decrease of the distribution noise involves a reduction of the damping of the input circuit. This is due to the fact that the distribution noise currents in the anode circuit and the screen-grid circuit are in anti-phase with one another (an accidental increase of the anode current results in an equal decrease of the screen-grid current), whereas the signal currents in the two circuits have the same phase. Consequently, there is no objection to choosing the inductance **12** and the capacity **13** of such value that the distribution noise is completely suppressed. It is true that, since the noise currents in the anode circuit and in the screen-grid circuit which are correlated with the cathode noise, have the same phase, the cathode noise is slightly increased due to the decrease of the distribution noise. This disadvantage may be eliminated, if need may be, by decreasing at the same time the cathode noise with the aid of the method described with reference to Fig. 1.

In a television receiver the inductance of the coil **12** required for complete compensation of the distribution noise is of the order of 0.25 microhenrys.

Fig. 7 shows a mixing circuit utilising means for decreasing the distribution noise. The received signal occurs in the input circuit **1** which is included in the circuit of the first control grid of the hexode **2**. The circuit of the second control grid comprises the local oscillator **14** which is indicated diagrammatically. The anode circuit comprises an oscillatory circuit **3** which is tuned to the intermediate frequency. In order to decrease the distribution noise, coils **15** and **15'** are included in the circuits of the two screen grids and are inductively coupled with an oscillatory circuit, which is tuned to the intermediate frequency and included in the circuit of the first control grid, in such phase that the noise current in the anode circuit which is correlated with the distribution noise decreases. The distribution noise currents in the circuits of the two screen grids are in anti-phase with the corresponding distribution noise currents in the anode circuit. The signal current in the anode circuit is in phase with the signal current in the

circuit of the outer-most screen grid but in antiphase with the signal current in the circuit of the inner screen grid. Consequently, the feed-back brought about by the coil 15 will cause the signal current in the anode circuit to increase, whereas the feed-back brought about by the coil 15′ decreases the signal current in the anode circuit. The coil 15 thus causes for the signal a positive feed-back and the coil 15′ a negative feed-back. It ensues therefrom that the distribution noise brought about by the outermost screen grid may be completely suppressed, whereas the distribution noise which is brought about by the intermost screen grid can be reduced but cannot be completely suppressed. Suitable proportioning of the two feed-back couplings exists, for example, when the feed-back by means of the coil 15 is so great that the distribution noise which is brought about by the outer screen grid is exactly suppressed while the feed-back by means of the coil 15′ is so chosen that the signal is fed back as strongly positive (by the coil 15) as negative (by the coil 15′.) The signal intensity in the anode circuit is in this case equally great as that without noise compensation while the noise in the anode circuit is materially reduced.

Instead of using separate coils 15 and 15′, use may alternatively be made of a common coil in which the two screen-grid circuits are preferably connected to different tappings. When using a tube in which the two screen grids are internally connected through, the latter embodiment is not possible so that in this case, an optimum decrease in noise cannot in general be obtained.

The circuit 16 preferably has an impedance of about 1000 ohms.

On principle, instead of using the described feed-back by means of the intermediate-frequency circuit 16, use might also be made of aperiodic feed-back. However, this involves the disadvantage that the received oscillations and the local oscillations also are fed back, due to which the good operation of the mixing tube might be disturbed. The described selective feed-back is consequently preferable.

Fig. 8 shows a low-frequency amplifying circuit comprising means for decreasing the distribution noise. The voltage to be amplified is supplied by means of terminals 17 and 18 to the primary winding of the input transformer 19 whose secondary winding is connected between the control grid and the cathode of the amplifying tube 2. The anode circuit of the tube comprises the primary winding of an output transformer 20 whose secondary winding is connected to output terminals 21 and 22. For decreasing the distribution noise, the input transformer 19 comprises an additional winding 23 which is included in the screen-grid circuit and which induces a noise voltage of the correct phase, which is correlated with the distribution noise, in the secondary winding of the input transformer.

The described methods for decreasing distribution noise and emission noise may be jointly used so that a decrease of the distribution noise and a decrease of one or more kinds of emission noise is obtained simultaneously. It is also possible to reduce all the noise components together by supplying a noise voltage derived from the anode circuit in the correct phase to a control grid. An example of the last-mentioned method is illustrated in Fig. 9. This figure shows a high-frequency amplifier utilising a secondary-emission tube. That part of the cathode lead which is common to the anode circuit and the control-grid circuit comprises an inductance 4. The secondary-emission electrode and the screen grid are connected for high frequency to that extremity of the coil 4 which is connected to the cathode so that the secondary-emission noise current and the distribution noise current flow through the coil 4. Consequently, a noise voltage occurs across the coil 4 which voltage is correlated with the noise of all the sources of noise present in the tube. This noise voltage is transferred through the control grid-cathode capacity to the input control grid, and this in such phase that all the noise components are decreased.

With regard to the possibilities of application of the various circuit arrangements it may be remarked that the circuit arrangements according to Figs. 1, 4, 6 and 9 are particularly adapted for wave-lengths below 30 metres, for which wave-lengths the inductances required for the decrease in noise can be easily realised. Furthermore the decrease in noise obtained is variable with frequency so that in the case of tunable amplifiers an optimum result is obtained for one frequency only; the frequency chosen therefore is preferably the highest frequency of the tuning range.

In view of the foregoing, for frequencies below 10 Megacycles/sec. ($\lambda > 30$ metres) and with tunable amplifiers use is preferably made of circuit arrangements in which the noise voltage required for the decrease in noise is supplied to a control grid by means of a transformer, such as is the case, for example, in the circuit arrangements of Figs. 7 and 8. The circuit arrangements of Fig. 5, whose operation with regard to the decrease in noise is independent of frequency can also very well be used in the two last-mentioned cases.

In the circuit arrangements of Figs. 1, 4, 5, 6 and 9 it is essential for correct operation that the input circuit constitutes at least approximately an ohmic resistance for the frequencies to be transmitted, in other words that the input circuit is tuned to the signal to be transmitted. The circuit arrangement described with reference to Figs. 2 and 3, in which use is made of the influence current flowing to the control grid and in which the input circuit is detuned relatively to the signal, can therefore only be combined which one of the circuits of Figs. 4, 5 or 6, if at the same time a phase correction is effected in order to give the correct phase to the noise voltage which is fed back to the control grid from the secondary-emission electrode or from the screen grid. This phase correction generally requires the use of ohmic resistances which constitute new noise sources.

When transmitting very high frequencies, for which the transit-time of the electrons is no longer negligibly small relatively to the period of the oscillations to be transmitted, it is further necessary to consider the phase displacements of the noise currents occurring in the circuits of the various electrodes which are brought about by the transit-times.

The operation of the various described circuit arrangements for noise decreasing is illustrated diagrammatically in Fig. 10. In this figure the signal current and the various noise currents in the output circuit are represented as a function of the intensity of the feed-back used to decrease the noise. For the sake of simplicity it has been assumed that all the currents have a linear variation with the intensity of the feed-back, which, of course, cannot always be the case in reality.

Line I represents the magnitude of the signal current in the output circuit. The same line also applies to the intensity of the cathode noise-current in the output circuit with the circuit arrangement of Fig. 1, since in this circuit arrangement the signal to noise ratio does not vary with the intensity of the feed-back. Line II represents the intensity of the cathode-noise-current in the output circuit for the case described with reference to Figs. 2 and 3 viz. that the cathode noise is decreased by detuning the input circuit. In this case the cathode noise-current in the output circuit can be reduced to nought while the signal current practically remains constant. Line III applies to the intensity of the secondary-emission noise current in the output circuit in the case of the circuit arrangement of Fig. 4. In this circuit arrangement the secondary-emission noise may be reduced to nought but only at the cost of a considerably decrease of the signal current. Line IV represents the intensity of the distribution noise-current in the output circuit with the circuit arrangements of Fig. 6 and 8. The distribution noise may be completely reduced to nought, in which event the signal current increases.

In the case of the circuit arrangement of Fig. 7 the intensity of the distribution noise-current brought about by the outer screen-grid may be represented by line IV while the line which indicates the intensity of the distribution noise-current brought about by the innermost screen-grid coincides with line I. On principle, the possibility must be considered that the intensity of a given noise current in the output circuit varies as represented by the dotted line V. In this case the noise current will increase with increasing positive feed-back but to a less high degree than the signal current. Consequently, in order to obtain an improvement in the signal to noise ratio in the output circuit, the intensity of the noise current would in this case have to be increased.

The question arises as to whether in the various circuit arrangements described the amplification may be controlled by variation of the bias of one of the electrodes of the tube without disturbing the decrease in noise obtained. It is readily understood that in the circuit for decreasing the cathode noise the result obtained does not vary if the cathode current remains constant. From a calculation it appears that the same condition applies to the case of the decrease of the distribution noise; in this case also the decrease in noise is not influenced, as long as the cathode current remains constant during the control. Consequently, in the circuit arrangements of Figs. 1, 6 and 8 the amplification may be controlled by variation of the bias of the suppressor grid.

It appears that in the case of the decrease of the secondary-emission noise, such as for example in the circuit arrangement of Fig. 4, the condition must be fulfilled that the primary current which flows to the secondary-emission electrode remains constant during the control. Consequently, in this case the amplification may be controlled by variation of the bias of the secondary-emission electrode.

In conclusion, some attention should be paid to the problem in what manner the aerial of a receiver must be coupled to the input circuit in the case that in the first stage of the receiver use is made of one of the noise-decreasing circuit arrangements described.

It is usually assumed that for obtaining an optimum signal to noise ratio the aerial must be coupled to the input circuit in such manner that a maximum signal voltage is set up at the control grid of the first tube. For this purpose, in the usual transformer coupling between the aerial circuit and the input circuit the secondary transformed aerial resistance R_a must be rendered equal to the circuit impedance R_k. The same condition also applies to other aerial couplings in which the secondary transformed aerial resistance is always to be understood to mean the reciprocal value of the damping exerted by the aerial on the input circuit. A fulfilment of this condition, however, has the effect of obtaining a maximum signal to noise ratio only in the case that the tube noise is highly predominant over the circuit noise. It is also clear indeed that, if only the tube noise need be taken into account, a maximum signal to noise ratio may be obtained by providing for a maximum control-grid voltage.

If, on the other hand, the circuit noise will be largely predominant to the tube noise so that solely circuit noise has to be considered, a maximum signal to noise ratio will be obtained by connecting the aerial directly to the control grid since in this case the signal to noise ratio which occurs in the aerial may only be increased by the addition of further circuit elements. Consequently, in this case the optimum signal to noise ratio would be obtained by a tightest possible coupling between the aerial and the input circuit, that is to say the condition for a maximum freedom of noise reads: $R_a=0$.

In practice both the tube noise and the circuit noise must be considered and consequently the optimum signal to noise ratio is obtained for a value of R_a which is comprised between the two stated values. It appears that the optimum aerial coupling is determined by the equation;

$$R_a=\frac{R_k}{\sqrt{1+\frac{R_k}{R_b}}}$$

in which R_b represents the equivalent noise resistance of the tube. In cases in which the "transit-time damping" plays an important part, a correction will still have to be made in this relation.

Now, it was already demonstrated above that the connection of an inductance in the cathode lead for the purpose of decreasing the cathode noise results in a variation of the damping of the input circuit, whereas the signal to noise ratio remains constant. Consequently, it will be clear that in calculating R_k in the above-stated relation the damping of the circuit brought about by the inductance in the cathode lead should be disregarded. It appears that the same remark applies to increases and reductions of damping which are brought about by the arrangement of means for decreasing secondary-emission noise and distribution noise. Consequently, in the above-stated equation there must be filled in for R_k the reciprocal value of the total damping of the input circuit decreased by the increases or reductions of damping which are brought about by noise decreasing measures, or in other words, in calculating R_k only the natural losses of the circuit, if necessary together with damping resistances included in series or in parallel in the circuit, and the "transit-time damping" must be considered.

MAXIMILIAAN JULIUS OTTO STRUTT.
ALDERT VAN DER ZIEL.
CORNELIS JAN BAKKER.

PUBLISHED MAY 25, 1943. BY A. P. C.

M. J. O. STRUTT ET AL
CIRCUIT FOR THE TRANSMISSION OF ELECTRICAL OSCILLATIONS
Filed Jan. 16, 1941

Serial No. 374,712

2 Sheets-Sheet 1

Fig. 1

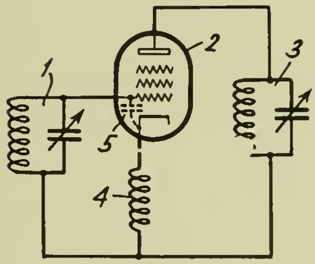


Fig. 2

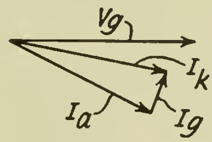


Fig. 3

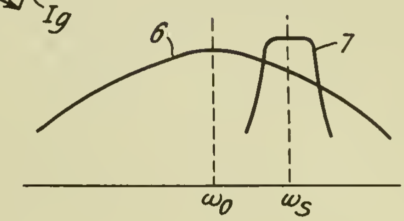


Fig. 4

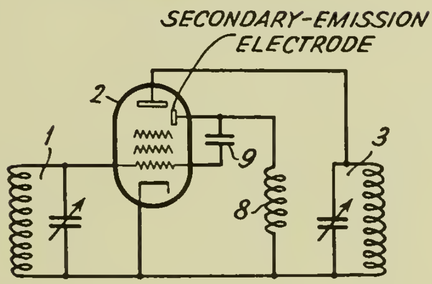


Fig. 5

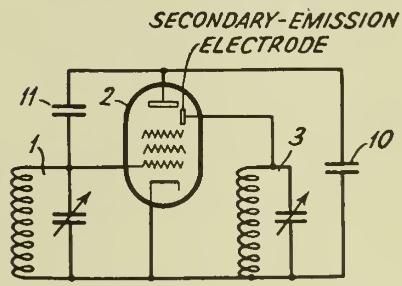


Fig. 6

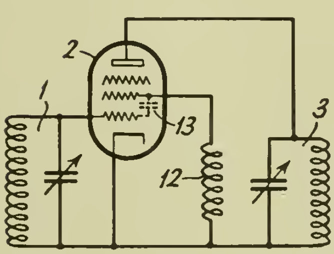
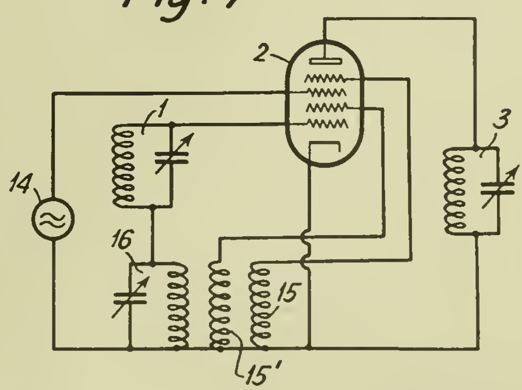


Fig. 7



INVENTORS
M. J. O. STRUTT, A. V. DER ZIEL
& CORNELIS JAN BAKKER
BY
H. S. Grover
ATTORNEY

PUBLISHED
MAY 25, 1943.
BY A. P. C.

M. J. O. STRUTT ET AL
CIRCUIT FOR THE TRANSMISSION OF
ELECTRICAL OSCILLATIONS
Filed Jan. 16, 1941

Serial No.
374,712
2 Sheets-Sheet 2

Fig. 8

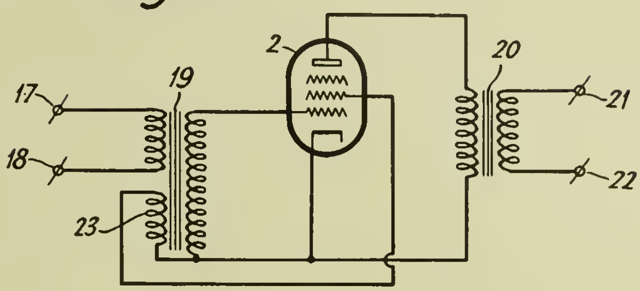


Fig. 9

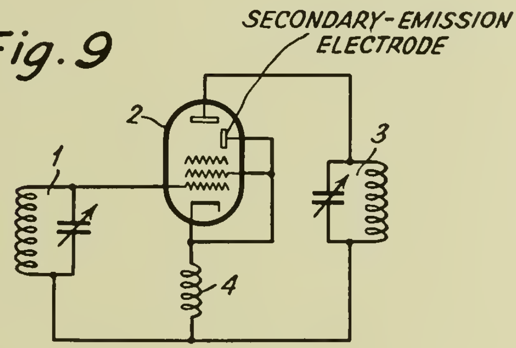
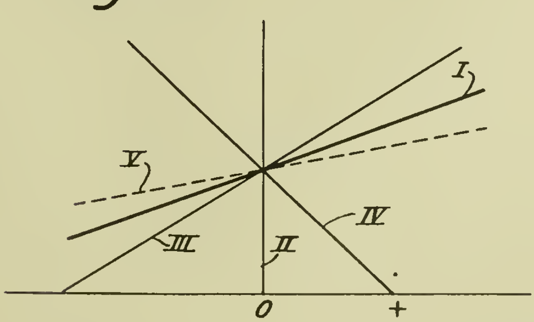


Fig. 10



INVENTORS
M. J. O. STRUTT, A. V. DER ZIEL
& CORNELIS JAN BAKKER
BY H. S. Grover
ATTORNEY

Published May 25, 1943 Serial No. 374,772

ALIEN PROPERTY CUSTODIAN

AUTOMATIC RECORD DISC CHANGING DEVICE FOR GRAMMOPHONES

Alberto Compare, Milan, Italy; vested in the Alien Property Custodian

Application filed January 16, 1941

This invention has for its object an improved automatic record disc changing device for grammophones, of the kind which allows arranging of a certain number of record discs, for inst. up to 10 discs, on the grammophone and reproducing same, successively, in a complete automatic manner, i. e. once started the grammophone, all operations to bring the discs on the turntable and to reproduce same, one by one, are effected automatically without to put hand on the grammophone.

More precisely the device, by acting the control knob towards the right, effects the following operations in succession: the switch is acted to start the motor so that the turntable begins to turn; the mechanism to release the first disc on the turntable is started; the pick up is brought on the edge of the disc and the stylus is made to engage the outermost groove of the disc; the disc changing mechanism is stopped.

On termination of the reproduction of the first disc, the pick up is raised and moved outwardly beyond the edge of the discs; the second disc is released on the turntable; the pick up is again moved but now inwardly and is brought with the stylus exactly on the beginning of the grooves of the disc and is made to engage same. The disc changing mechanism and pick up controlling mechanism is again stopped.

These operations are repeated automatically on termination of the reproduction of each disc, up to the last disc, without being necessary to effect any control or other operation by hand.

On termination of reproduction of the last disc, the grammophone is automatically stopped.

The device allows, further, to repeat a disc at the termination of its reproduction; to this purpose it is sufficient to move the control knob anticlockwise. In this way the disc changing mechanism remains inoperative and the same disc is repeated.

Further, by moving the control knob clockwise during any moment of reproduction of a disc, this reproduction is immediately ceased and the disc changing device is started in order to reproduce the next disc.

The device further allows to arrange, with any order, a number of discs having differing diameters and both the disc changing mechanism as well as the pick up controlling device work automatically for any order of succession of discs of differing diameter.

The disc changing device according to this invention comprises a cranked spigot which is immovably inserted into the shaft carrying the turntable; on said spigot are arranged the discs to be reproduced, in form of a pile. It comprises further a disc releasing device disposed laterally on the limit of the turntable, a pick up controlling device and a device controlling the disc releasing device; these three devices cooperate in a manner to effect automatically the above described operations.

The present invention refers more particularly to certain improvements in these devices, which have the purpose to assure simplicity of the single pieces and of the devices, security of working, reducing of the number of pieces so that, as a consequence, reducing of manufacturing cost of the device is obtained. The new and useful improvements according to this invention are particularly set forth in the claims attached at the end of this specification.

The annexed drawings show the object of the invention.

Fig. 1 is a perspective view of the external assemble of the disc changing device according to this invention;

Fig. 2 is a perspective view, from above, of the mechanism for controlling the disc releasing device and the pick up moving device;

Fig. 3 is a view from behind of the disc releasing device;

Fig. 4 is a detail of the disc releasing device,

Fig. 5 is another detail of this device;

Figures 6 to 18 are details of the mechanism shown in Fig. 2;

Fig. 19 shows the lateral disc support and with the arm holding the pile of discs in horizontal position.

The device comprises a base plate P*i* and a cover plate P*s*; the latter is partially removed in Fig. 2 in order to show the various devices. The most organs of the devices are arranged between these two plates and are fixed or pited on the base plate P*i*.

M and *m* (Figs. 1 and 7) indicated the control knobs which are supported in the cover plate P*s* and serve to control the single operations, i. e. to start the grammophone, to arrest it, to repeat a disc and to reject a disc. Knob M is connected with a control bar 101 which, through a transmission plate 102, pivoted on the base plate P*i*, controls a controlling lever 103. This lever 103 (Fig. 6) presents a superior stud 103A, an inferior stud L03B and a raised tongue 103C. The free end of lever 103 presents a lowered portion, on which a guide lever is pivoted, which is guided on base plate P*i*, and terminates with a raised tongue 134. This control lever 103 controls start-

ing of the motor, as well as of the disc chaing and pick up moving device, as will be described hereafter.

Knob *m* is connected to a bar 5, which is guided, at the other end on the base plate by means of slot and pin and which carries on the underside of its free end a stud by which it may move the lever 106 of the switch of the motor, in order to switch it off.

A double lever 107 serves to arrest the turntable by means of the gum bottom fixed on one end of same, (Figs. 8, 8A). Said lever is pivoted on the base plate P*i* and is acted by a spring 108 which presses the gum bottom against the inner border of the turntable, whilst a loosely pivoted tooth 109 serves to bring and to hold it in the non arresting position.

On the pivot of the transmission plate 102 there is also pivoted a double lever 111 (Fig. 12) which serves to receive with its arm 111*a* the action for the disc changing operation from a cam disc 110 and to transmit said operation with its arm 111B to the organs to release the next disc on the turntable. The arm 111A of this lever is acted by a cam disc 110 which during one complete revolution controlls all operations of disc changing and pick up moving.

The cam disc 110 has a small inferior cam 110B and a small superior cam 110A, as well as a cam guide 110C. It is fixed on the same axis of the toothed wheel 119 which is meshing with a pinion fixed on the motor shaft 123, which bears also the turntable 2. The inferior cam 110B serves to actuate lever 111 which provocates releasing of the discs on the turntable. The cams 110A and 110C serve to control the tone arm which carries the pick up. To this purpose the cam disc cooperates with a controlling lever 112. This lever is pivoted on the base plate P*i* and bears on its pivot a spring tensioned so as to push the lever towards the disc cam 110. In the rest position of the grammophones (fig. 12) this lever rests against the cam 110A and the axial spring of the lever is tensioned. About at midway the lever 112 bears on its underside a loosely pivoted balancing member 114, the one end of which carries a tooth projecting laterally above the lever 112. Further, on the upper side of the free end of lever 112 there is pivoted a small plate by means of a pivot 115 forming a stud on the upper side of the lever. The small plate carries another stud 115A at its free end. By means of a spring fixed on its pivot 115, the plate is pressed against a stud fixed on the lever 112. In correspondence of the latter stud, but on the underside of lever 112, there is another stud 116.

The toothed wheel (fig. 15) which is normally meshing with the motor shaft 123, may be disengaged from this shaft by means of the cut portion 119A of the wheel itself; this portion 119A is fixed on a lever 120 pivoted in a point of the wheel 119 and acted by a spring also fixed on this wheel. One end of the lever 120 carries a stud 121 which is extending upwardly through disc 110 and is projecting above said disc where it carries a plate 122. On the common axis of the toothed wheel 119 and cam disc 110, above same, there is also pivoted a lever 117 made of two parts, the one of which is acted by a spring 117A fixed on the other. This lever 117 carries, on its underside, a springy plate 118.

126—127 (figs. 9–10) are the adjusting levers to adjust the disc changing and tone arm moving device for a freat or a small disc as the case may be.

The lever 127 is pivoted on the base plate P*i* and the lever 126 is pivoted on lever 127, at point 135. The lever 126 is acted by a spring disposed on its pivot and presents a raised position so as to allow fixing of a stop 136 on the lever 127. The end of lever 126 near the pivot point of lever 127 carries a tooth 128 projecting laterally. The end of lever 127 opposite to its pivot is attacked to element 130 having an opening 130A, within which element 131 is hookable. The end of lever 126 is in front of cam 110B of disc 110. The lever 127 is also acted by a spring 129.

Fig. 17 shows levers 139, 140 which control lowering and raising of the tone arm carrying the pickup, respectively at the beginning and at finishing of the reproduction. To this purpose the lever 139 presents an opening in which a pin fixed on the pivot of the tone arm is guided. The free end of lever 140 carries a roller running against the peripheric edge of cam disc 110. The two levers 139 and 140 are pivoted together and lever 140 is further pivoted on the base plate P*i*.

Fig. 18 shows the elements—a plate 137 with a stud 137A and an organ 138 with a loosely pivoted tooth 138A—which provocate starting of the disc changing device when the reproduction of a disc is finished.

Fig. 19 shows schematically the lateral support for the discs on the releasing device with the arm 141 carrying a gum roller resting on the topmost disc and a plate 144 pivoted on said arm, which serve to hold the pile of discs in horizontal position, to assure resting same on the lateral support so that they may be surely engaged by the releasing organs, and, at least, to arrest the grammophone after reproduction of the last disc.

This latter action is effected by a tooth 142 which is attacked to the arm 141 and which pushes a lever 143, pivoted on the structure of the releasing device, which pushes the lever 106 of the switch 104 so that the lever 106 is brought beneath the toothed wheel 119.

Figures 3, 4 and 5 show the disc releasing device. This device is consisting of a structure fixed on base plate P*i*. On the top of this structure is hinged the arm 141; further a support 41 is hinged at this structure towards the inside, i. e. towards the turntable; support 41 is hinged on two lateral projections of said structure which projections form the support for the great discs, while 41 is the support for the small discs. On support 41 is guided the tooth 39 serving to release the small discs. Support 41 may be lowered by means of articulated elements 43, 44, and 132, as shown by dotted lines in fig. 4, so as to allow releasing of the great discs.

The tooth 39 bears on its pivot a plate 34 projecting downwardly; against this plate 34 rests another plate 35 projecting upwardly and fixed on the balancing member 131, which is loosely pivoted on a fixing block 38.

33 is the releasing organ, which is guided on block 38, by means of two lateral flanges 33*a*, 33*b* through which pass a pin 37, fixed on block 38. A spring is arranged between one flange 33*a* and the block 38, so as to return the organ 33 after each action. Hook 133 is fixed on said organ 33. 36 is a guide for the organ 33.

57 indicate the central cranked spigot; 2 the turntable; 56 the discs and 12 a gum bottom fixed on the underside of the turntable near its turning axis.

The various automatic operations of the device proceed as follows:

(1) By rotating knob M to the right, the control lever 103 is moved to the right; this lever, by means of its inferior stud 103B acts firstly on the switch 104 and starts the motor. Then the superior stud 103A pulls the lever 107 which suppasses the tooth 109; this latter becomes raised, because its opposite part is heavier and therefor blocks up the lever 107 so that the turntable is now free to turn and it begins the turn. The raised tongue 103C of lever 103 has displaced the lever 117, so that the plate 118 of same has freed the plate 122 and thus the lever 120, which is pulled by its spring and brings the portion 119A to mesh with the motor shaft 123. Thus begins rotation of the toothed wheel 119 and of the cam disc 110. The position shown in Fig. 12 corresponds to the rest position of the device and with a small record disc in releasing position that is to say in the lowest position of the pile. The tone arm with the pickup is in the rest position outward the turntable.

At beginning of its rotation, cam disc 110, by means of its inferior cam 110B pushes immediately the arm 110A of lever 111 the arm 111B of which pulls the lever 133. The latter pulls the organ 33 which acts on tooth 39 which thus releases the lowest disc on the turntable 2. After this, the superior cam 110A, which in the meantime held the lever 112 and therewith the tone arm 6 in rest position, allows the lever 112 to move inwardly. The lever 112 moves inwardly under the action of its axial spring and follows the cam guide 110A. By moving inwardly the lever 112 brings also the tone arm with the pickup inwardly. To this purpose serves a double lever 113 which is fixed on the tone arm pivot. The tooth 114A of the lever 112 passes beneath the end of lever arm 113A and during this passing beneath the tooth 114A is slightly lowered. When the tooth 114A has surpassed the lever 113A, it is again raised, because its opposite end 114 is heavier. The arm 113A is now between the tooth 114A and the stud 115A of plate 115 and this latter has been slightly moved in opposition to its axial spring. Continuing the rotation of cam disc 110, the lever 112 also continues its inward displacement and as a consequence the lever arm 113A is also moved inwardly and with it also the tone arm. This movement is arrested when the lever 112 is arrested, by its inferior stud 116 against stop 136 fixed on the adjusting lever 127 the position of which corresponds exactly to the diameter of the record disc just released on the turntable. Therefore, the tone arm with the pickup is brought exactly above the border of this record disc. In this moment, when lever 112 is arrested by stop 136, the cam disc 110 has reached, with the flat portion of its peripheric cam guide, the roller of lever 140 so that the levers 139, 140 may become displaced, by the weight of the tone arm so as to allow lowering of the tone arm. After this, the flattened beginning portion of cam guide 110C of the cam disc 110 is arrived in correspondence of member 114. The guide 110C raises this end 114 and now the stud 115A of plate 115, which is slightly tensioned by a spring, as said, pushes slithly the arm 113A. This pushing of arm 113A, and as a consequence of the pickup, serves to bring the stylus of the latter to engage the outermost groove of the record disc and to begin thus the reproduction. In this moment, the plate 122 is arrested by plate 118 of lever 117 and therefore the cut portion 119A of the toothed wheel is disengaged from the pinion of the motor shaft 123 and thus the wheel 119 is arrested. Now the disc changing and pickup moving device is arrested and only the motor shaft carrying the turntable rotates.

(2) When reproduction of the record disc is finished, the mechanism is in the position shown in Figs. 2 and 15. At the termination of reproduction the stylus of the pickup is moved inwardly with a rapid curve, as known. Thus the arm 113B pushes the element 138 near the motor shaft 123. When now the gum bottom 12, fixed on the underside of the turntable near this shaft, passes in this point, it pushes the element 138 again in opposite direction whereby the element 138A moves the plate 122 which becomes thus freed from plate 118. In this way the portion 119A may return to mesh with pinion 123 and the wheel 119 begins to rotate. As now the disc cam 110, at the beginning of its rotation, is in the position shown in Figs. 2 and 15, its first action will be that of its peripheric cam guide, which acts on roller of lever 140 and raises the pickup. Immediatcly thereafter the cam 110A begins to move outwardly the lever 112 which moves outwardly the tone arm. In the meantime the cam 110B reaches the lever 111A and provocates, in the described manner, releasing of the next disc. Now the cam 110A allows returning of the tone arm and beginning of the next reproduction, in the described manner.

(3) When it is desired to interrupt reproduction of a disc, during any movement of its playing, and to play the next disc, then one rotates knob M towards the right. With this movement, the tongue 103C of controlling lever 103 moves lever 117, which liberates plate 122 so that the disc changing device is immediately started and the next disc is brought onto the turntable and the pickup becomes moved so as to play this new disc, in the manner already described.

(4) When a disc should be repeated, one rotates the control knob M to the left, during any moment of its reproduction or on termination of same. With this movement the tongue 103C of control lever 103 raises the lever 133; when now, at the end of reproduction the disc changing and pick up moving device is started, in the described manner, then the lever 111 cannot act on lever 133 and therefor no new disc is released on the turntable. The cam disc 110 commands only the tone arm as to repeate the record disc lying on the turntable. The control lever 103 remains in the repeating position where it is held by a spring acted lever 146 and by an inferior stud 147 and must be returned in normal position by returning the control knob M by hand.

(5) To arrest the grammophone at any desired moment, one rotates control knob *m* to the right, so that bar 105 pushes the lever 106 of the switch 104 switching off the motor.

(6) When the reproduction of the last disc of the pile is finished, then the tooth 142 of arm 141 (figs. 14 and 19) presses on lever 143 which pushes the end of lever 106 beneath the toothed wheel 119. On termination of reproduction of the last record disc the wheel 119 is started in the known manner and the inferior stud 148 of this wheel acts on the lever 106 so as to switch off the motor. The lever 106 pushes also the inferior portion of balancing tooth 109 the tooth part of which will thus be lowered and the lever

107, under action of its spring 108, presses its gum bottom against the inner edge of the turntable arresting it.

Before switching off the motor, the disc cam 110, by means of guide 110A and lever 112 has brought the tone arm in rest position.

The aforesaid six automatic operations have been described supposing that always a small disc was in releasing position, because the normal position of all elements of the device corresponds to the diameter of a small disc.

Supposing now, that a great disc follows to a small disc in the releasing position in the pile; this great disc presses down the tooth 33 and as a consequence the plate 34 becomes displaced slightly towards the right (in fig. 5); now the balancing hook lever 131 with plate 35 may be unhooked from opening 130A of lever 130. The unhooking is made possible when the cam 110B, at the beginnig of its rotation, pushes a little the lever 126 connected to lever 127 through a hook 128. The lever 131 is unhooked from lever 130 because its rear portion is heavier than its hook portion.

When now the wheel 119 and the cam disc 110 are started, then the lever 126—127 tends to move inwardly as drawn by spring 129 and thus also lever 130 becomes drawn, which by means of levers 132, 44 and 43 lowers the support 41 for the small discs, as shown with dotted lines in fig. 4. Now the great disc is free to be released and its releasing is commands in the same manner as a small, with the difference that no element 33 directly acts on the disc to be released.

At the same time, the stop 136 fixed to lever 127 is brought inwardly, so that the tone arm carrying the pickup is arrested by this stop in a position corresponding to the border of a great disc.

At beginning of the next disc changing operation, the cam guide 110A pushes firstly levers 126—127 again outwardly so that support is again raised; accordingly that no a small or a great disc is in releasing position, the hook may be hooked in lever 130 or may not be hooked, so that, after being passed cam guide 110B, the levers 126—127 may become drawn inwardly or not, accordingly that a great or a small disc is in releasing position.

When effecting the repeating operation, the control lever 103 which in this case becomes moved towards the left, frees the hook 128. In this manner the disc cam 110 moves only the lever 126 which does not effect any operation, whilst the levers 127 and 130 are not operated and remain in their position that is to say in the outer position when a small disc is on the turntable for playing and in the inner position, when a great disc is on the turntable for playing.

ALBERTO COMPARE.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. COMPARE
AUTOMATIC RECORD DISC CHANGING
DEVICE FOR GRAMMOPHONES
Filed Jan. 16, 1941

Serial No.
374,772

6 Sheets-Sheet 1

Fig. 1

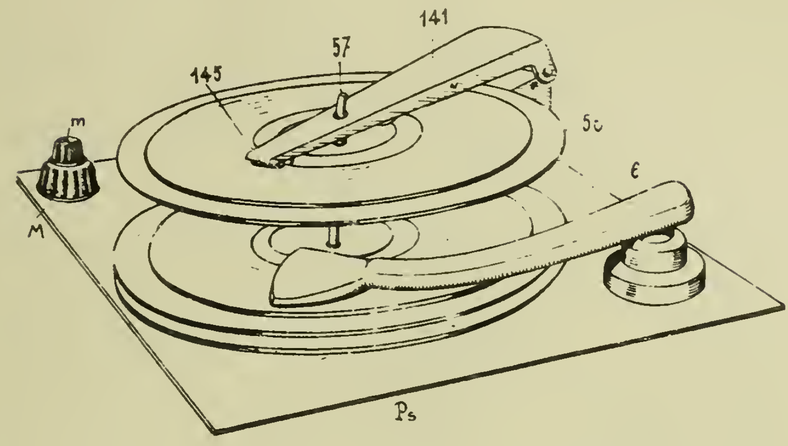
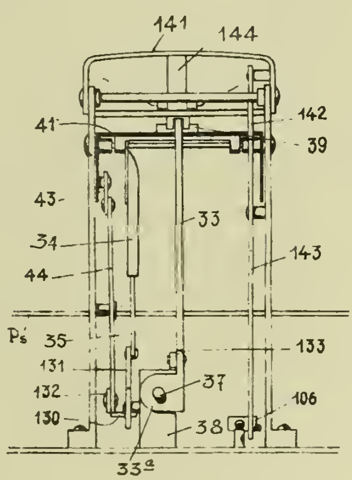


Fig. 3.



Inventor:
Alberto Compare
By: Stevens and Davis
Atty's.

PUBLISHED

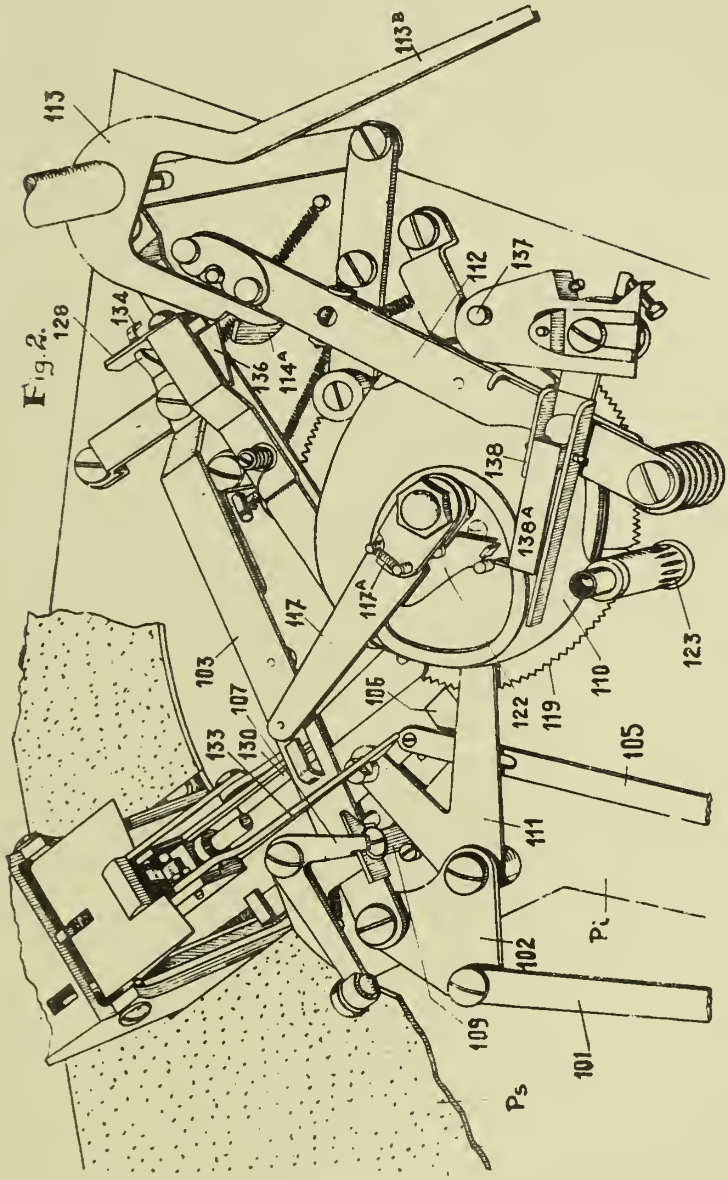
MAY 25, 1943.

BY A. P. C.

A. COMPARE
AUTOMATIC RECORD DISC CHANGING
DEVICE FOR GRAMMOPHONES
Filed Jan. 16, 1941

Serial No.
374,772

6 Sheets-Sheet 2



INVENTOR
Alberto Compare

By Stevens and Davis

Attorneys

PUBLISHED

MAY 25, 1943.

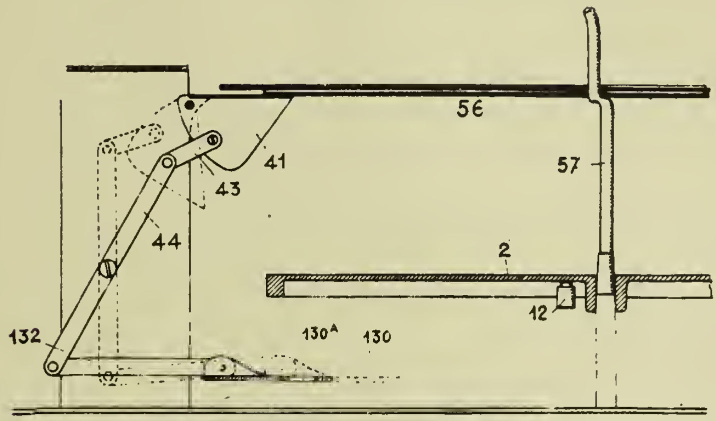
BY A. P. C.

A. COMPARE
AUTOMATIC RECORD DISC CHANGING
DEVICE FOR GRAMMOPHONES
Filed Jan. 16, 1941

Serial No.
374,772

6 Sheets-Sheet 3

Fig. 4.



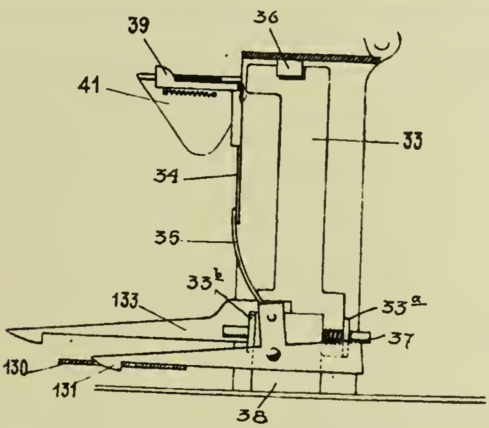


Fig. 5.

Alberto Compare
INVENTOR.

BY Stevens and Davis

ATTORNEYS.

PUBLISHED

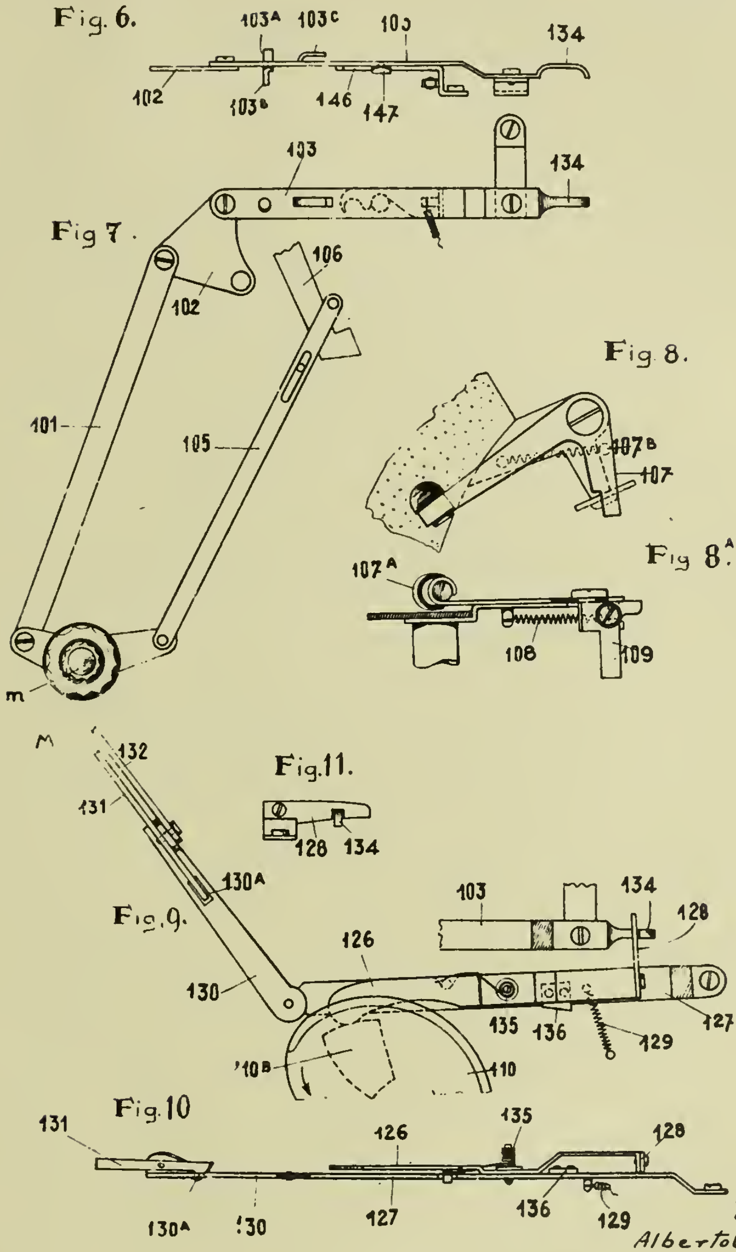
MAY 25, 1943.

BY A. P. C

A. COMPARE
AUTOMATIC RECORD DISC CHANGING
DEVICE FOR GRAMMOPHONES
Filed Jan. 16, 1941

Serial No.
374,772

6 Sheets-Sheet 4



Inventor
Alberto Compare

By Stevens and Davis

Attorneys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. COMPARE
AUTOMATIC RECORD DISC CHANGING
DEVICE FOR GRAMMOPHONES
Filed Jan. 16, 1941

Serial No.
374,772

6 Sheets-Sheet 5

Fig. 12^A.

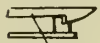


Fig. 12.

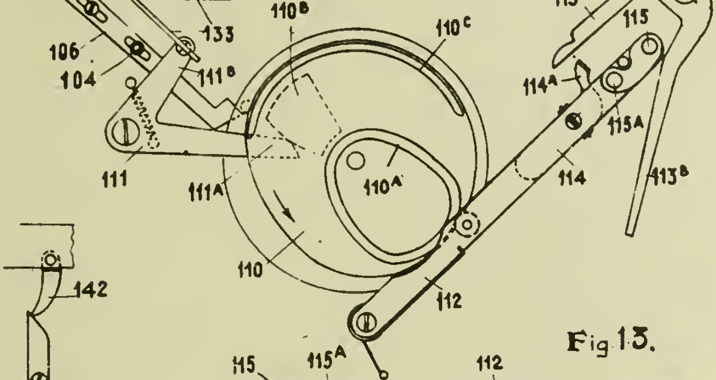


Fig. 13.

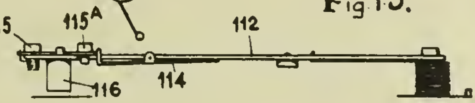


Fig. 14.

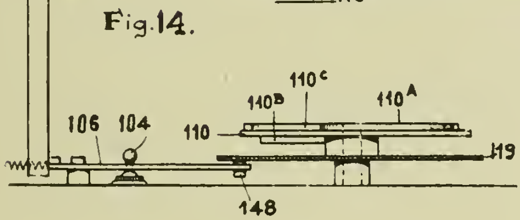


Fig. 15.

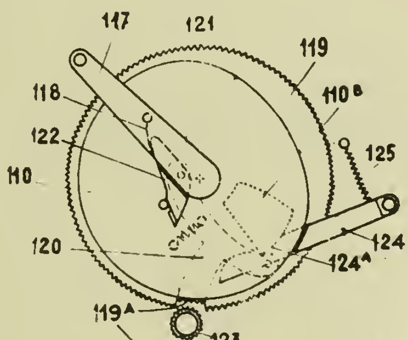


Fig. 16.

Alberto Compare
INVENTOR.

BY *Stevens and Davis*

ATTORNEYS.

PUBLISHED MAY 25, 1943. BY A. P. C.	A. COMPARE AUTOMATIC RECORD DISC CHANGING DEVICE FOR GRAMMOPHONES Filed Jan. 16, 1941	Serial No. 374,772 6 Sheets-Sheet 6

Fig. 17.

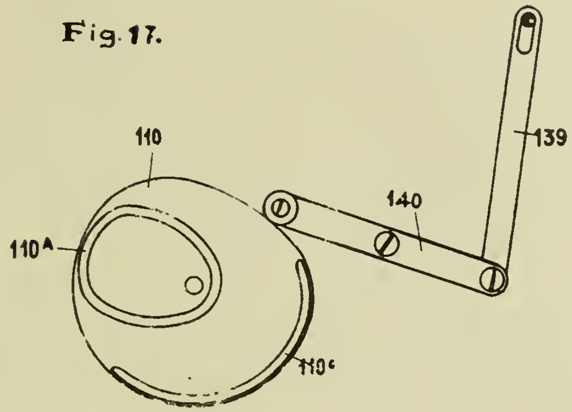


Fig. 18

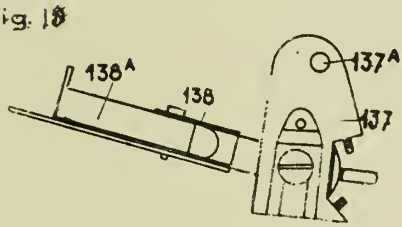
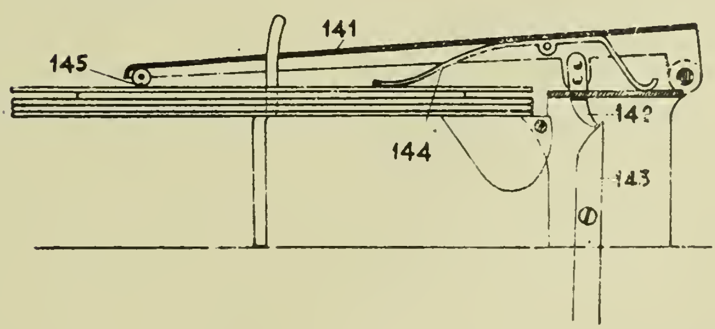


Fig 19.



Alberto Compare
INVENTOR.

BY Stevens and Davis

ATTORNEYS.

Published May 25, 1943

Serial No. 374,780

ALIEN PROPERTY CUSTODIAN

METHOD AND DEVICE FOR MECHANICAL RECORDING

Arnaud Cramwinckel and Cornelis Johannes Dippel, Eindhoven, Holland; vested in the Alien Property Custodian

Application filed January 16, 1941

Our invention relates to a method and device for mechanically recording a sound track which has depth variations and optically-reproducible width variations which are an enlargement of the depth variations.

As is well known dirt deposited on an optically-reproducible sound track, for instance dust, particles of film material, or the like, is largely responsible for a hiss during reproduction. It has been suggested to remove this dirt from both surfaces of the carrier at the area of the sound track before the sound track is optically scanned. It is also known that a deposit of dust on the light-sensitive emulsion prior to or during the formation of the photographic sound track deleteriously affects the recording and the quality of the track obtained and therefore the recording and subsequent development and fixation are usually carried out in rooms which are as free as possible from dust.

In photographic sound-recording it is primarily the emulsion surface of the carrier, i. e. the surface on which recording is effected, which should be kept free from any dirt which might intercept or diffuse the exposure light. Any dirt that may exist on the surface of the carrier remote from the exposure light, i. e. the exposed surface of the celluloid or acetyl cellulose supporting layer, has no influence during the photographical recording upon the quality of the sound record. During the reproduction only the particles of dirt which exist at the area of the track have an influence and these particles are responsible for only a small portion of the total hiss produced during the reproduction.

The term "recording surface" as used herein and in the claims is to be understood to mean the surface at which the sound track is located, and the term "supporting surface" is to be understood to mean the surface which bears upon the surface of a supporting member at the point of recording.

Although in photographic recording it is mainly desirable to remove the light-absorbing or light-diffusing dirt from the recording surface of the carrier, we have found that in mechanical recording of the above-mentioned type it is mainly desirable to remove both light-transmitting and opaque dirt from the supporting surface of the carrier prior to the formation of the sound track. More particularly, if only one surface of a carrier is cleaned and the carrier is wound on a reel, the cleaned surface would engage the other surface, and as the dirt would be attracted to the cleaned surface due to an electrostatic charge on the carrier. Thus, it would be necessary that cleaning be effected during the recording process i. e. after the carrier is unwound from the reel and immediately before recording.

We have found that the presence of dirt on the supporting surface of the carrier results in greatly interfering additional noise during reproduction of a mechanically-recorded track of the above-mentioned type, because a particle of dirt between the carrier and the supporting member causes a locally-raised position of the carrier. Thus, during the recording the cutting edge of the cutting tool penetrates locally to a greater depth into the carrier and consequently a supplementary width variation occurs opposite the particle of dirt.

Our invention is of particular importance in connection with methods of recording in which the width variations of the track are an enlargement of the depth variation, for instance recording of the type described in the U. S. Patent #1,919,116 to James A. Miller. In such methods of recording the amplitude of the width deformation caused by the presence of a particle of dirt between the supporting surface of the carrier and the surface of the supporting member would be several times the thickness of the particle.

If, in accordance with the above mentioned patent, the track is cut by means of a cutting tool having a V-shaped cutting edge of a large apical angle, for instance 1740, a particle of dirt having a size of about 20 microns may cause a local track widening of about 800 microns or 0.8 mm, which in the case of a neutral track width of 0.3 mm causes a decided local widening of the track which is audible during reproduction as an intense dull detonation. Because of width variations which are greatly enlarged with respect to the depth variations, the interfering influence of the presence of dirt in mechanical recording is much greater than in photographic recording. In fact in photographic recording particles of dirt between the carrier and its support are of practically no importance, i. e. the locally-raised position of the carrier causes substantially no variations in the shape of the light line in the emulsion. If particles of dirt are present in the path of the recording light, the interfering influence, insofar as they may intercept the light, depends only on their direct size.

We prefer to clean not only the supporting surface of the carrier but also to clean the re-

cording surface prior to the recording because once the track has been cut it is exceedingly difficult to remove any dirt that gets into the depressions of the track.

During mechanical recording of the track particles of the carrier disengage from the chips cut therefrom and these particles may deposit on both surfaces of the carrier and be pressed into the material of the carrier during the winding operation effected subsequent to recording. Because of this we prefer also to clean the carrier on both sides after the recording and in some cases even again before the winding operation.

We prefer to effect the cleaning by means of a cleaning device comprising a group of directed hairs, for example a strip of velvet or a brush. In this case the dirt slides between some of the said hairs and is retained, so that the cleaning device no longer readily disengages the dirt on to the film surface and is in addition capable of absorbing considerable dirt before being saturated.

If the carrier has been cleaned in the manner described above, any dirt that exists on the carrier and in some cases in the recording device is prevented from depositing on the carrier mechanical recording and re-winding. If the sound track is optically reproduced after the mechanical recording, it is advisable to subject the carrier to another cleaning operation prior to the optical reproduction in order to remove any dirt which may be deposited on the carrier during its passage along the guide rollers and guide surfaces.

In order that the invention may be clearly understood and readily carried into effect we shall describe the same in more detail with reference to the accompanying drawing, in which

Fig. 1 is a perspective view of a carrier and shows a cutting tool,

Fig. 2 is a diagrammatic view of a recording system comprising a plurality of cleaning devices,

Fig. 3 is a partly-sectionized side view of a cleaning device, and

Fig. 4 is a side view of a cleaning device according to another embodiment of the invention.

The carrier shown in Fig. 1 comprises a thin covering layer 10 of opaque material provided on a supporting layer 11 of a transparent material of good cutting properties. The carrier is moved at a constant speed in the direction of the arrow 2 over a supporting member 14, which may be a stationary block as shown, or a rotating roller, while a cutting tool 12 is vibrated in the direction of the double-headed arrow 3 in accordance with the sound being recorded. The cutting tool 12, which has a V-shaped cutting edge having a large apical angle, for instance an angle of about 174°, removes portions of the opaque layer 10 and of the cutting layer 11 to form in the carrier a sound track 4 having depth variations and width variations which are an enlargement of the depth variations.

If there is a particle of dirt 13 on the supporting surface of the carrier, i. e. the surface which bears upon the surface of the supporting member 14, the carrier will be slightly raised locally from the surface of member 14. As a result the thin covering layer 10 will be raised slightly at this point and the sound track at the location of the particle 13 will have a width greater than that which corresponds to the amplitude of the cutting tool. With a V-shaped cutting edge of the above mentioned angle, the width variations of the track are about 40 times the depth variations so that the deformation in the boundary of the track due to the particle 13 will be about 40 times the thickness of this particle.

It should be noted that the above difficulties occur not only when the track is surrounded by opaque portions, as shown, but also when the track is cut into a transparent layer and is then blackened. In the latter case the deformation causes a sharp projection of the blackened track.

The recording device diagrammatically shown in Figure 2 is used for recording a variable-depth and variable-width sound track in a carrier or tape 27, which may be of the type shown in Fig. 1. The carrier 27 is unwound from an unwinding reel 15 and moves in the direction indicated by the arrows. More particularly, the carrier 27 passes over a guide roller 16, through a cleaning device 17, over a guide roller 18, over a recording roller 20, through a cleaning device 22, through an optical scanning system 23, over a roller 50 and onto a winding reel 24. A roller 19 presses the carrier against roller 20.

The recording is effected at roller 20 by means of a recorder 21 which may have cutting tool of the type shown in Fig. 1. As suitable recording devices, scanning devices and driving devices are well known in the art, further description or illustration of the same is believed to be unnecessary.

When carriers of non-conductive substance, such as carriers comprising a gelatin cutting layer carrier by a celluloid supporting layer, are unwound from an unwinding reel in a dry atmosphere, they receive an electrostatic charge which attracts many particles of dirt. Furthermore, dirt is deposited on the carrier at points at which it is carried for the purpose of guiding and at which the edges pass along flanges or plates, i. e. along the rollers 16 and 18. To remove this dirt the cleaning device 17 is arranged in front on the point of recording i. e. so as to clean the carrier before the track is cut. As the electric discharges also exist on the carrier after cleaning and besides for other reasons dirt is deposited on the carrier, for example at the guiding points, this cleaning operation should be effected as short a time as possible before the recording of the track. The cleaning device 17 therefore is arranged as close as is constructionally possible in front of the recording device 21. Because of the lack of space it is not possible to locate cleaning device 17 between the last guide roller 18 and the recording roller 20, and this is why it is arranged after the next to the last roller 16.

The cleaning device 17 cleans not only the supporting surface but also the recording surface of the carrier because the particles of dirt existing on the latter surface might enter the depressions of the cut track and influence the light during reproduction. Furthermore, it should be noted that due to the varying depth of the track it would be very difficult to remove such particles.

During cutting, the material removed is in the form of a continuous chip or shaving which is generally removed from the point of recording by suction. However, in practice small particles are disengaged from this shaving and might deposit on the carrier even after cutting. There is the danger that such particles, if they get between the carrier and the surface of the supporting member, or during winding between the turn of the coil, may be pressed into the material of the carrier. Because of this we prefer to repeat

the cleaning as soon as possible after the recording.

In the recording device of Fig. 2 the second cleaning member 22 is located after the recording roller 20 and the roller 19, and cleans both surfaces of the carrier. Thus, we ensure that before the optico-electrical reproduction for checking the recorded sound track is effected by means of the device 23, the carrier is made as free from dirt as possible on both surfaces. The cleaning member 22 is therefore arranged in front of the point of optical scanning 23. When the carrier is then wound on the winding reel 24 there is as little dirt as possible between the turns. If desired, cleaning may be affected again immediately before winding, i. e. by a cleaning device (not shown) located between reel 24 and roller 50.

We may further clean the carrier when it is rewound on the unwinding reel 15, which is generally of an interchangeable form. This cleaning operation is effected by a cleaning device 25 on the rewinding path (indicated by a dotted line) the carrier during which the carrier engages a guide roller 26. This cleaning operation may be effected on both sides of the carrier or on the supporting surface.

The cleaning devices 17, 22 and 25 of Fig. 2 may be of the construction illustrated in Fig. 3. The device shown in Fig. 3 comprises a housing 51 provided at its ends with two openings 52 and 53 for the passage of the carrier 27, which moves in the direction of the arrow 36. Within housing 51 and bearing upon the upper surface of the carrier 27 is a piece of velvet 34 while a second piece of velvet 35 engages the lower surface of the carrier and is pressed thereto by a pressing block 33 and two compression springs 32. The short, grouped hairs of the velvet 34 and 35, which extend substantially perpendicular to the surface of the carrier brush away the particles of dirt loosely-seated on the surfaces of the carrier. The width of the said strips is greater than the width of the carrier itself so that also the lateral sides of the latter are cleaned by the hairs.

If this brushing action is not sufficient to remove the dirt, for example because the adhesion of the dirt to the carrier is greater than the force that the hairs can exert on these particles of dirt, the adhesion of the cleaning member may be increased artificially by the addition of substances of greater adhesion, such as liquids and in some cases tacky or greasy liquids or greasy substances in general. As examples of such substances we may mention sulfonated recinusoil or olive oil. For this purpose, a feed tube 38 extends through an aperture 37 provided in the top of housing 51 near the point at which the carrier 27 enters the cleaning device. The aperture 37 extends at least throughout the width of the carrier and a small supply of the desired liquid or fat is passed through the tube 38 to the velvet and the surface to be cleaned. The substance applied is removed together with the dirt by the portions of the velvet strips remote from the aperture 37.

If cleaning is effected by means of a volatile liquid such as carbon tetrachloride with some alkohol and water, the recording surface of the carrier may also be treated in the above manner. The portion of liquid which is not removed in the further part of the cleaning members volatilizes from the track. Non-volatile liquids and fats can be used for cleaning only the supporting surface of the carrier but they have to be removed together with the dirt by means of a strip of velvet.

The cleaning member shown in Fig. 4, which preferably serves for dry cleaning, comprises four brushes 41 supported in carriers 40. The bristles of brushes 41 are not at a right angle to the surface of the carrier 27, as in the case of the hairs of the velvet in Fig. 3, but from an acute angle therewith. Furthermore, the bristles are in "anti-direction" with the direction of movement 36 of the carrier 27 i. e. they form an obtuse angle with the surface of the incoming carrier. The length of the bristles is of the order of magnitude of 10 mms. i. e. many times greater than that of the velvet, and therefore each bristle per se must be stiff in order that it may form an angle with the surface of the carrier in spite of the pressure of the bristles on the carrier, i. e in order that it may not become located in the plane of the carrier. The necessary pressure of the bristles on the surface of the carrier is procured by the resilience of the bristles themselves. With such a cleaning device the length of the bristles is greater than with the velvet, and therefore more dirt can be absorbed before the brushes are saturated and must be replaced. When replacement is necessary the bristles 41 can be withdrawn from the carriers.

Although we have described our invention in connection with specific examples and applications we do not wish to be limited thereto because obvious modifications will appear to one skilled in the art.

ARNAUD CRAMWINCKEL.
CORNELIS JOHANNES DIPPEL.

PUBLISHED MAY 25, 1943. BY A. P. C.

A. CRAMWINCKEL ET AL

METHOD AND DEVICE FOR MECHANICAL RECORDING

Filed Jan. 16, 1941

Serial No. 374,780

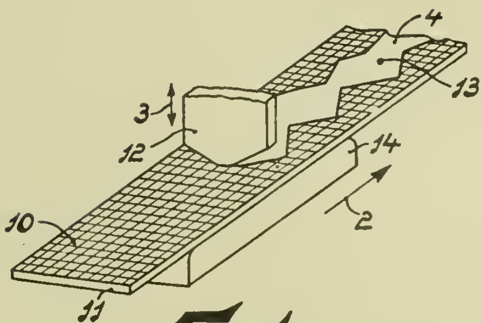


Fig. 1

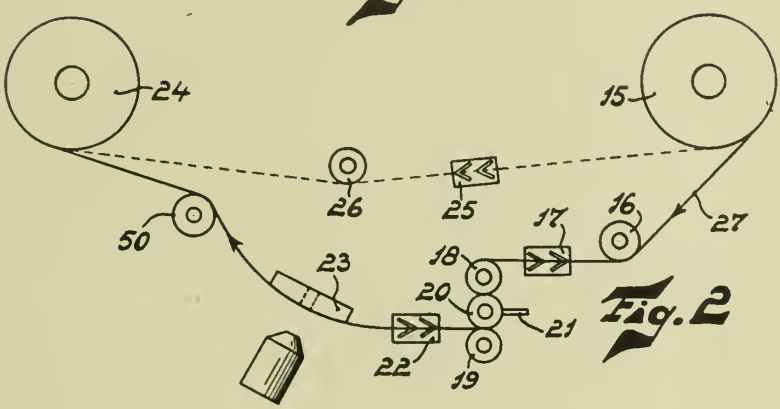


Fig. 2

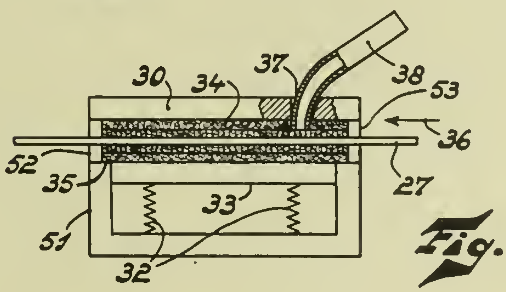


Fig. 3

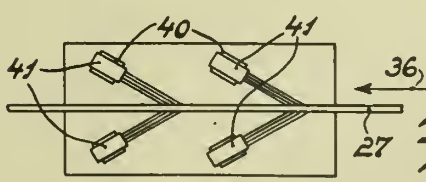


Fig. 4

INVENTORS
A. Cramwinckel and
C. J. Dippel

By C. F. Wendroth

ATTORNEY

Published May 25, 1943 Serial No. 374,842

ALIEN PROPERTY CUSTODIAN

RESILIENT CONNECTION OF A WHEEL SUSPENSION OR A SUSPENSION OF AN AGGREGATE OF AN AXLE TO A VEHICLE

Karl Wilfert, Sindelfingen, and Béla Barényi, Boblingen, Germany; vested in the Alien Property Custodian

Application filed January 17, 1941

The present invention relates to a resilient connection of a wheel suspension or a suspension of of aggregate of an axle to a vehicle (the frame or the carriage body of a vehicle), particularly for vehicles provided with half axles of oscillation, altering the gage. The invention substantially consists in this that independent on the main spring-suspension of the wheels, the wheel suspension or the aggregate of the axle cam yield substantially transversely to the direction of drive as well as upwardly, i. e. in a direction vertically or inclined to the track-way, has, however, in another direction no or only a slight resiliency with regard to the frame or to the carriage body of the vehicle.

In connection with wheel suspensions in which the wheels during deflecting of the springs are subjected to alterations of the gage, particularly therefore in connection with so-called oscillating half axles, shocks vertically as well as transversely directed to the direction of drive occur in the joints of the oscillating half axles which result from the fact, that the point of contact of the wheel with the rod surface tends to change its distance from the centre longitudinal plane of the vehicle.

According to the invention these shocks, acting substantially in a vertical and also in a transverse direction to the direction of drive, are intercepted and absorbed before they may be transferred to the frame. Simultaneously resiliency in an other direction is rendered as small as possible to exclude a tendency of the vehicle towards floating and to avoid if possible indefinite movements of the axle relatively to the frame.

In suitable adaptation to the forces occurring and to the conditions of movement, the resiliency transversely to the direction of drive preferably is selected larger than the upwardly directed resiliency in such a manner that the first mentioned resiliency corresponds completely or substantially completely to the alteration of the gage of the vehicles. The resiliency in a transverse direction as well as in an upward direction is obtained by the same elastic buffers which are arranged between the frame or the carriage body of the vehicle on the one hand and a supporting member for the aggregate of the axle or the wheel suspension on the other hand, while the main spring-suspension of the wheels preferably is mounted between the wheel or a member oscillating with the wheel and the supporting member.

The invention furthermore consists in this that, for the purpose of obtaining a resiliency of the aggegrate of the axle or the wheel suspension in a transverse direction and eventually in a vertical direction, a mechanism, preferably a link parallelogram swingably arranged substantially in a horizontal plane and subjected to the action of a spring is provided which serves to guide the wheel suspension or the aggregate of the axle. The resiliency of the link parallelogram hereby preferably is obtained by spring members subjected to torsional stress and mounted in the joints of this link parallelogram. For instance it is possible to use spiral springs or torsion bars. A particular advantageous arrangement is the employment of rubber sleeves arranged in the joints of the link parallelogram, preferably in the joints connecting the links to the member supporting the wheel suspension or the aggregate of the axle. The rubber buffers hereby are subjected to thrust stresses for the purpose of obtaining a vertical resiliency and to torsional stresses for the purpose of obtaining a transverse resiliency of the aggregate of the axle.

By the use of such a link parallelogram, the forces occurring may be controlled in a particular suitable manner, because the vertical forces act in the direction of the axis of the pivots of the links and are absorbed in a particular convenient and reliable manner by the bearings of the pivots of the links or by the rubber sleeves respectively. Simultaneously the link parallelogram allows a kinematic positive guidance of the axle transversely to the longitudinal direction of the frame or the carriage body of the vehicle. It is possible that the pivots of the links on the vehicle show an inclination in a vertical plane positioned in the direction of the drive.

In the accompanying drawing one construction according to the invention is shown by way of example.

In this drawing:

Fig. 1 shows a side elevation of an aggregate of the axle according to the invention,

Fig. 2 is a plan view of this construction, and

Fig. 3 shows a rear elevation of same.

The wheels *a* are mounted upon half axles of oscillation *b* formed as oscillating half axles which are laterally linked to a differential gear *c* by means of pivots. The differential gear *c* is fixed to a transversely arranged supporting member *d* against the ends of which bear the not guided coiled springs serving as main spring-suspension of the wheels.

Welded or in other suitable manner fixed to the supporting member *d* are metal sleeves *f*. In the latter rubber sleeves *g* are mounted the outer

surfaces of which are preferably biassed to a certain degree and connected in a strongly adherent manner to the metal sleeves *f* and the inner surfaces to the pivot like centre portion of a U-shaped link *h*. Passed through the outer ends *i* of each link *h* is a vertical supporting pivot *k* which is journalled in the upwardly bent rear end *l* of a tube-like longitudinal beam *m* of the frame.

To drive the wheel a Cardan shaft o is used which for instance is driven by a motor arranged in front.

As may be seen from Fig. 2, the frame together with the two links *h* and the supporting member *d* forms a link parallelogram A—B—C—D swingably arranged in the horizontal plane. With upwardly directed shocks the rubber sleeves *g* are subjected to thrust stresses, whereas with shocks, acting in a transverse direction, the rubber sleeves *g* are torsionally stressed. The links hereby swing about the joint points A and B respectively in the direction of the arrow *x* or *y* respectively to the right- or left hand side of drive, whereby they correspondingly guide in parallel the aggregate of the axles. Consequently during deflecting of the springs of the wheel and the hereby caused alterations of the gage the entire aggregate of the axle may laterally give way with regard to the frame or the carriage body of the vehicle respectively without the frame or the carriage body of the vehicle positively participating in this lateral movement. Shocks and vibration phenomenona occurring at the frame are hereby avoided.

Instead of providing a resiliency of the entire aggregate of the axle, i. e. a joint resiliency of both wheels of a pair of wheels, a corresponding resiliency of each individual wheel suspension of a pair of wheels may be provided. In this case, each wheel is suspended from a special supporting member which, for instance due to a connection by means of a horizontally arranged link parallelogram, may yield in a transverse direction as well as eventually in a vertical direction also. This arrangement is of advantage in so far, as the lateral movement of one of the two wheels not positively causes a corresponding movement of the other wheel.

Moreover, instead of being arranged to swing in a horizontal plane, the link parallelogram may also be arranged to swing in a plane somewhat inclined to the horizontal plane, for instance in a plane inclined upwardly towards the rear, whereby forces, returning the aggregate of the axle, automatically come to action. Moreover, the joints, particularly the joint enclosed by the rubber sleeve *g*, may be so arranged that their axles steeply extend upwardly in the direction of the shocks acting on the wheel, i. e. towards the rear. Hereby shocks, caused by the wheel running over unevennesses of the rod, may be absorbed in a favorable manner.

Moreover, by the use of a link parallelogram, oscillating in a horizontal or nearly horizontal plane, a transverse resiliency may be provided eventually also without providing for a vertical resiliency. The rubber sleeves *g* preferably are arranged as near as possible to the vertical transverse plane passing through the centre of the wheels. The rubber sleeves thereby may be arranged in front or in rear of the oscillating axles, whereby the latter eventually may be passed between the U-shaped links.

Instead of rubber sleeves or similar resilient elements subjected to torsional stresses, other springs also may be used which tend to hold the link parallelogram in a centre plane. The links eventually may be replaced by leaf springs in such an arrangement in which the planes of the individual leaves of the springs extend vertically so that the leaf spring may transversely swing to the direction of drive.

In connection with individually yieldable wheel suspensions, link systems different from the form of a parallelogram may be used.

KARL WILFERT.
BÉLA BARÉNYI.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

K. WILFERT ET AL

RESILIENT CONNECTION OF A WHEEL SUSPENSION
OR A SUSPENSION OF AN AGGREGATE
OF AN AXLE TO A VEHICLE

Filed Jan. 17, 1941

Serial No.
374,842

Fig. 3.

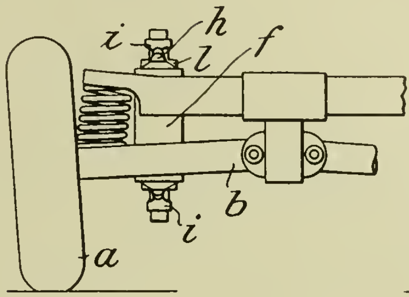


Fig. 1.

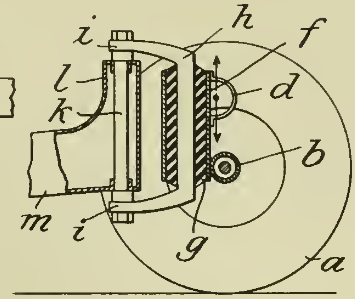
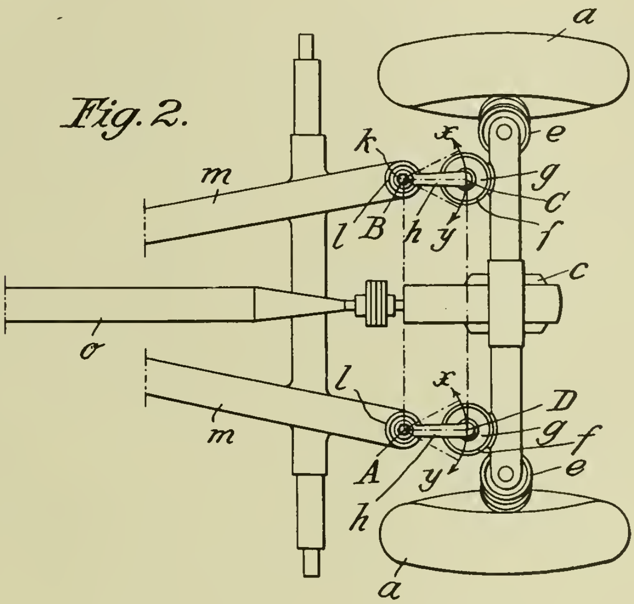


Fig. 2.



INVENTORS:
KARL WILFERT
BELA BARENYI
by A. A. Dicke
ATTORNEY

Published May 25, 1943

Serial No. 374,940

ALIEN PROPERTY CUSTODIAN

LANTERN HEAD FOR HURRICANE LAMPS

Bruno Nier, Beierfeld, Germany; vested in the Alien Property Custodian

Application filed January 17, 1941

The invention relates to a lantern head for hurricane lamps of the cold blast type in which an inner chimney is arranged axially movable in a stationary outer chimney. It has shown to be practical in lantern heads of this type, a form of construction of which is shown in the Fig. 1 of the accompanying drawing in vertical section, to enclose the outer chimney **4**, which surrounds the axially movable chimney **1**, by a casing which extends approximately from the lower edge of the outer chimney **4** having the shape of a truncated cone to below the reflector **3**, and this casing may consist of two elements **13**, **17** shiftable telescope-like the one into the other. By this casing **13**, **17** extinguishing of the flame of the lantern is prevented in case air currents or blasts should occur which impinge against the lantern head perpendicularly to the axis of the lamp.

The invention has for its object to considerably simplify the production of this casing **13**, **17** surrounding the outer chimney **4**, and also the fixation of this casing on the lantern and to secure, at the same time, the lantern against shock and hurricanes. This object is attained according to the invention in that the casing enclosing the outer chimney is constructed as a clip of cylindrical or approximately cylindrical or conical shape, and that the commonly used lower edge of the outer chimney in the shape of a truncated cone is omitted, so that between the outer chimney and the clip-like constructed casing an unhindered air movement can take place.

Figs. 2 and 3 of the accompanying drawing show in two elevations standing perpendicularly the one to the other a first embodiment of the invention in which the clip-like casing is of cylindrical shape,

Fig. 4 is a horizontal section on line C—D of Fig. 3,

Fig. 5 is a section on line A—B of Fig. 2,

Fig. 6 shows a second embodiment of the invention, in which the lower part of the clip-like casing is of conical shape.

As can be seen from Figs. 2 and 3 the outer chimney is surrounded by the casing **20**, which extends to the reflector **3** or beyond the same. This casing **20** is, according to the invention, constructed similar to a clip, that is it is composed of two clip halves which have flap-like vertical extensions **18**, **19** on the edges by means of which extensions these clip halves are united the one with the other and both with the tubes **16**.

In the form of construction shown in Fig. 6 the lower part of the casing is of conical shape, and the two halves of the clip have large flaps **20'** far extending in lateral direction, which engage over the upper ends of the tubes **16** of the hurricane lantern, as also shown in the cross-section E—F.

The casing **20** may also be of an other form as that shown in Figs. 2, 3 and 6. Supposition herefor is merely, that the form selected admits the construction of the casing as a clip composed of two parts according to the invention.

BRUNO NIER.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

B. NIER

LANTERN HEAD FOR HURRICANE LAMPS

Filed Jan. 17, 1941

Serial No. 374,940

2 Sheets-Sheet 1

Fig. 1

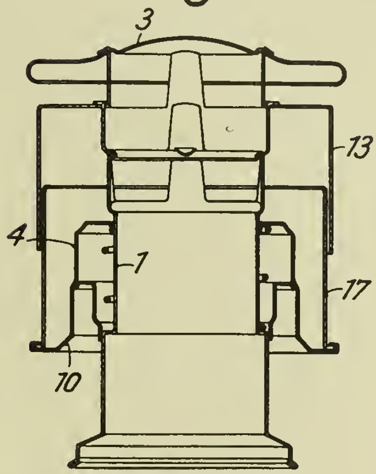
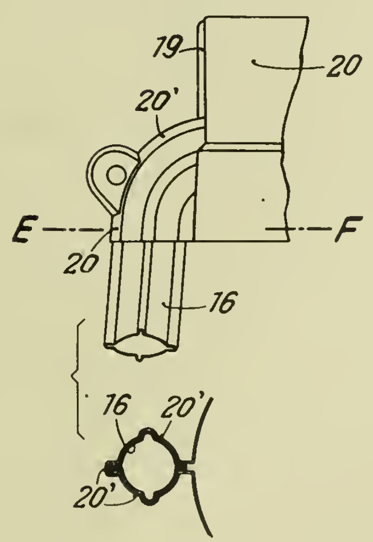


Fig. 6



Inventor:
B. Nier

By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

B. NIER
LANTERN HEAD FOR HURRICANE LAMPS
Filed Jan. 17, 1941

Serial No.
374,940
2 Sheets-Sheet 2

Fig. 2

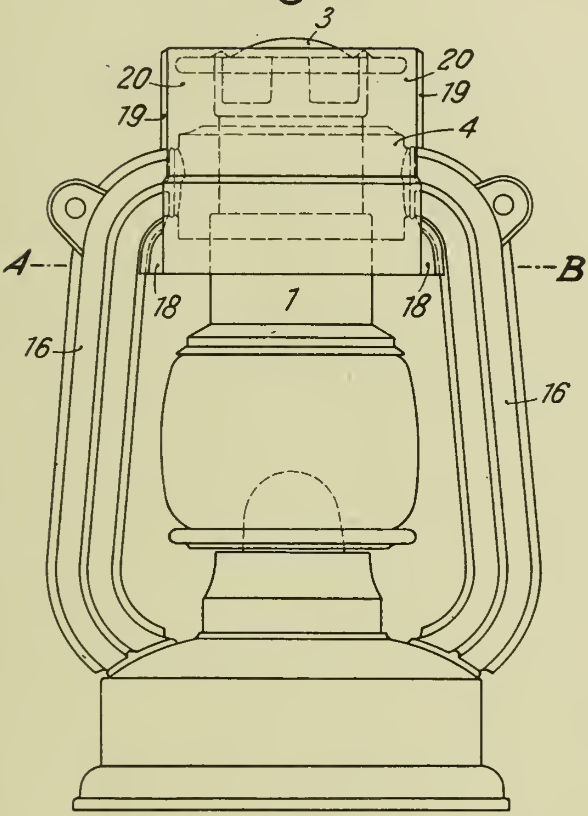


Fig. 3

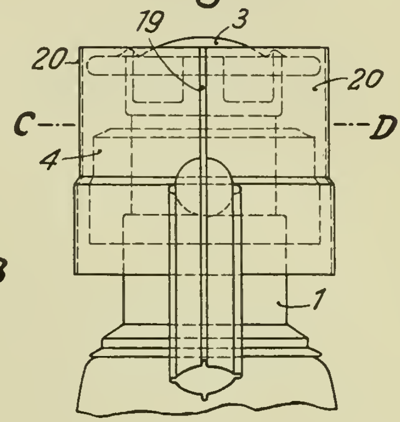


Fig. 4

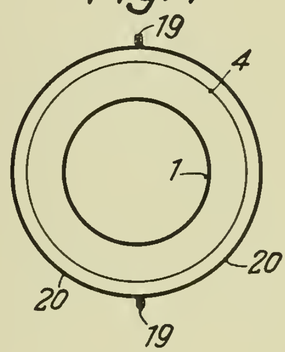
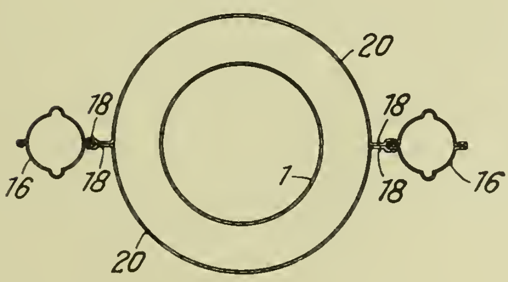


Fig. 5



Inventor:
B. Nier

By: Glascock Downing & Seebold
Attys.

Published May 25, 1943 Serial No. 375,429

ALIEN PROPERTY CUSTODIAN

SCALE ILLUMINATION

Alwin Weber, Berlin, Germany; vested in the Alien Property Custodian

Application filed January 22, 1941

It is known to illuminate the scales or dials of instruments and apparatus by means of sources of light mounted on the casing. In the majority of cases the light sources are provided outside in front of the protective crystal or pane, for the reason that posteriorly thereof there is too little space. However, whenever the light source is provided, say, laterally in respect to the scale, then the middle portion of the scale is not light enough for the reason that the light rays fail to strike the scale correctly. The purpose of the invention is to arrange the illumination of the scale in such a way that the scale will be illuminated uniformly and with sufficient brightness, without increasing the case of the instrument or the space between the scale and the protective crystal or pane to create space for one or more sources of illumination.

According to this invention adequate and satisfactory illumination of a scale is attained by making the protective pane or crystal of strong glass and by using the same for the guiding of the light-rays issuing from a source of light mounted adjacent to or below the pane or crystal. The glass pane could have a facet by which the light rays are deviated and thrown directly upon the dial. In this way the dial can be brightly illuminated, while the rest of the front plate or panel remains unilluminated, with the result that the scale becomes so much more conspicuous and contrasting. The use of a strog and heavy protective glass pane in front of the instrument or apparatus offers the further advantage that parts of the apparatus alive with high potential current which may possibly not be sufficiently covered by the front panel, will be insured more efficiently than heretofore. In such instrument the source of light (of the stage type) is supported in such a way in the plane of the heavy glass pane that it is separately accessible for replacement, without any necessity or risk of touching any of the high-potential current-carrying parts.

The invention is illustrated by way of example in the appended drawing. Fig. 1 is a cross-sectional view, and Fig. 2 a front elevation of an apparatus equipped with the novel lighting means here disclosed.

Within the casing *a* is housed a measuring or indicator device *b* of any nature at all. There is provided a scale *c*. The casing *a* is anteriorly covered by means of a heavy glass pane *d* which is provided with a polished and shining surface *e*. Opposite the latter, below the glass plate *d*, is mounted a source of illumination. The latter may consist of the stage type lamp *h*. This lamp is lodged in a chamber *i* of the casing *a* so that for its substitution all that is necessary is to open the locker slide *o* which shuts the chamber from the outside. Hence, the other parts of the instrument which may carry high-potential curent cannot be touched. The glass pane *d* is thus flooded by the light rays of the lamp *h*, these rays being deflected by surface *e* and directed onto the scale *c*. No matter where the dial or such portion of the indicator or reading means on the front panel of the instrument which are to be made particularly conspicuous may be located, it will always be feasible to dispose the facet on the glass pane in such a way that the pencil of light rays will be directed to the area where intensive and bright illumination is required.

ALWIN WEBER.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. WEBER
SCALE ILLUMINATION
Filed Jan. 22, 1941

Serial No.
375,429

Fig. 1.

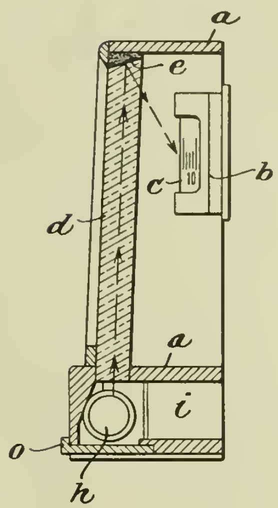
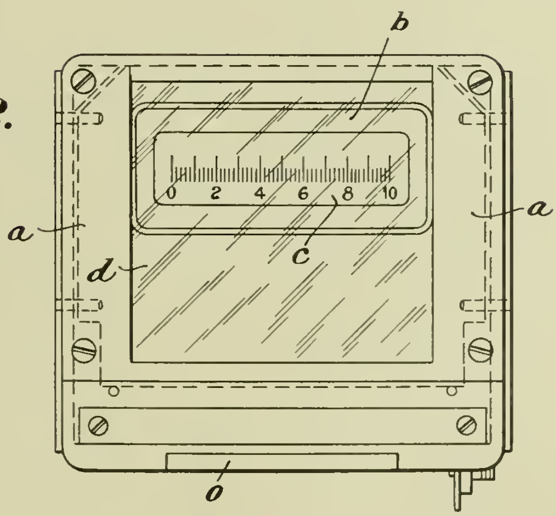


Fig. 2.



INVENTOR
Alwin Weber
BY H. S. Grover
ATTORNEY

Published May 25, 1943

Serial No. 375,511

ALIEN PROPERTY CUSTODIAN

TIRE VALVES

Georg Hoffmann, Nurnberg, Germany; vested in the Alien Property Custodian

Application filed January 22, 1941

My invention relates to improvements in tire valves and more particularly in tire valves of the type comprising a slitted disk controlling the supply of air to the air tube of the tire. My improved valve is particularly designed for use in tires of bicycles. But I wish it to be understood that my invention is not limited to such use. In tires of this type the disk is clamped in position by means of parts of the body of the valve engaging the margin of the disk.

The object of the improvements is to provide a valve of the type indicated in which the operation of the disk is not interfered with by the clamping pressure acting on the margin thereof, and in which, further, the disk is not spoiled by excessive pressure. With these objects in view my invention consists in providing means for limiting the movement of the said clamping parts of the valve body towards each other and into clamping engagement with the said disk, the said means being arranged so that the disk is compressed at its margin only so far as is needed for holding the same in position without impairing the proper operation of the disk.

In the preferred construction the said disk is partly embedded within a cavity made in one of the parts of the valve body, so that it slightly projects from the said cavity.

For the purpose of explaining the invention several examples embodying the same have been shown in the accompanying drawing in which the same reference characters have been used in all the views to indicate corresponding parts. In said drawing

Fig. 1 is a sectional elevation showing the valve and a part of the tire, the controlling disk being in the position in which the slit is open for permitting the flow of the air into the air tube,

Fig. 2 is a plan view of the disk,

Fig. 3 is a sectional elevation similar to the one illustrated in Fig. 1 and showing a modification, the controlling disk being in closed position, and

Fig. 4 is an elevation partly in section showing another modification.

In the construction shown in Figs. 1 and 2 the valve comprises an externally screw-threaded tubular member *a* formed at its bottom end with a flange *n*, an externally screw-threaded tubular member *b* formed with a milled flange *p* and an externally screw-threaded nipple *q*, an internally screw-threaded sleeve *c* having a milled portion *w* and connecting the members *a* and *b*, and a nut *d* screwing on the member *a* and cooperating with the flange *n* for clamping the member *a* on the air tube *f* as is known in the art. As shown, the sleeve *c* cooperates with the nut *d* for fixing the valve to the rim *r* of the wheel. Normally the valve is closed by a screw-cap *g* placed on the nipple *q*. The bore *l* of the member *b* ends at its inner end in a conical portion *i* having a cylindrical margin *i'*, and the bore *m* of the member *a* ends at its outer end in a conical portion *k* having a cylindrical margin *k'*, the said conical and cylindrical portions being coaxial of the bores *l* and *m*. The conical and cylindrical portions *i* and *i'* provide a seat for a metal disk *e* formed with eccentric bores *e'* ending in enlarged portions *e''*, the bottom end of the disk *e* being slightly spaced from the lower end face of the member *b*. Within the circular cavity thus produced a disk *h* of elastic material such as india rubber is fitted, the depth of the said cavity being smaller than the thickness of the disk *h* which, therefore, projects from the cavity. The metal disk *e* and the india rubber disk *h* are held in position within the said conical and cylindrical portions by the members *a* and *b*, the member *b* being screwed into the sleeve *c* so far that it bears with its lower face on the upper face of the member *a*. Thus the disk is embedded in the cylindrical portions *i'* and *k'*, and the relative dimensions of the said cylindrical portions and the rubber disk *h* are such that slight clamping pressure is exerted on the margin of the disk *h*. The disk *h* is provided with a slit *h'* which is normally closed and which is opened only when the disk is bulged downwardly by the external pump pressure. When no external pressure is applied to the valve, the disk *h* is pressed by the pressure within the air tube *f* flat on the metal disk *e*, so that the slit *h'* is closed, the disk *e* providing a means for thus holding the disk *h* flat. If however pressure is applied by means of the pump through the body *b* the disk *h* is bulged downwardly, so that the slit *h'* is slightly opened as is shown in Fig. 1, and the disk finds a support on the wall of the conical cavity *k*, so that it is not pressed out of the cylindrical cavities *i'* and *h'*.

In the construction shown herein, in which the disk *h* slightly projects from the cylindrical portion *i'* when the bodies *a* and *b* are out of contact with each other the disk *h* is but slightly compressed at its margin so that the material is not pressed inwardly which would interfere with the opening of the slit *h'*.

In Fig. 3 I have shown a modification in which the disk *e* is dispensed with, and the rubber disk *s* is fixed within the tubular body *b*, for convenience in assembling the parts of the valve.

As shown, the member b is formed at its inner end with a cavity having tapering walls i, and the disk s is fitted in the said cavity and it is held in position therein by the undercut wall i. The bottom of the said cavity i is plane, and it provides a flat support for the disk s. The bore l in the member b is reduced in cross-section at its inner end, as is shown at l' and the slit s' of the disk s ends on the said reduced portion l'. Otherwise the construction of the disk s is similar to the construction of the disk a described with reference to Fig. 1, and the disk is but slightly compressed at its margin when the member b is screwed into the sleeve c and into engagement with the member a.

In Fig. 4 I have shown a modification in which the construction of the parts of the valve is similar to the construction now in use, in which however the controlling disk has a construction similar to the examples shown in Figs. 1 to 3. More specifically the construction of the controlling disk corresponds to the construction shown in Fig. 3.

The valve comprises an externally screw-threaded tubular member **2** formed with a flange **3**, a tubular member **4** formed with a nipple **5**, a screw-cap screwing on the member **2** and formed with a flange **6** bearing on a shoulder **7** of the member **4**, and a cap **8**. The tubular member **2** is fixed to the air tube by means of a nut **9** and a washer **10**, and it is fixed to the rim of the wheel by means of a nut **11**. The construction of the controlling disk **12** is similar to the construction described with reference to Fig. 3.

It appears therefore that in the manufacture of the valve parts of standard shape may be used, and that the operation of the valve is the same as that of valves now in common use.

GEORG HOFFMANN.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

G. HOFFMANN

TIRE VALVES

Filed Jan. 22, 1941

Serial No.

375,511

Fig. 1.

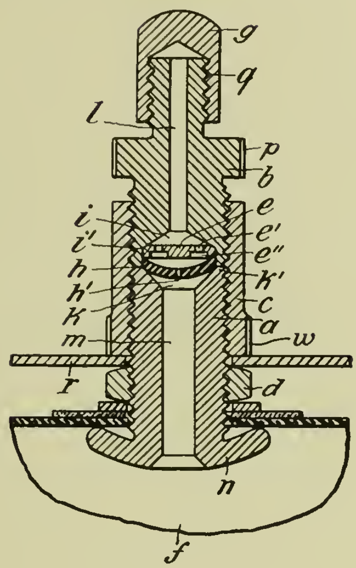


Fig. 3.

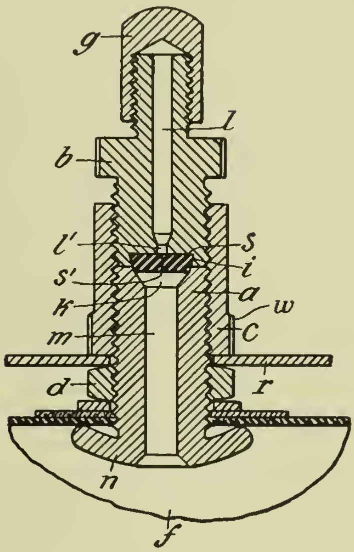


Fig. 2.

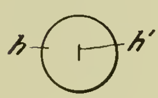
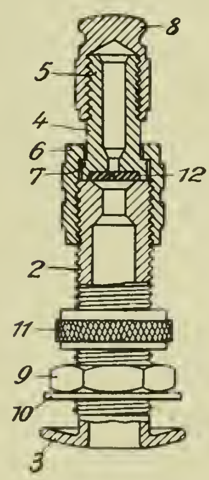


Fig. 4.



Inventor

Georg Hoffmann

By

Blair, Curtis & Hayward

Attorneys

Published May 25, 1943 Serial No. 376,309

ALIEN PROPERTY CUSTODIAN

ELECTRONIC MICROSCOPES

Manfred von Ardenne, Berlin-Lichterfelde-Ost, Germany; vested in the Alien Property Custodian

Application filed January 28, 1941

The invention relates to improvements in electronic microscopes.

In the microscopic technique there is a desire to simplify the methods of carrying out microscopic and submicroscopic manipulations on the objects to be tested, since the hitherto known steel or glass probes employed as micromanipulators have not the fineness necessary for many applications of the electron optics.

The object of the invention is to improve the method of carrying out investigations with the aid of an electronic microscope. According to the invention an ion producing device is combined with an electronic microscope, from which device an ion ray probe may be directed onto the object. Such an ion ray probe presents the advantage over the mechanical probes hitherto employed in biological investigations in that it has a far greater sharpness and that in the layers located above and below the object layer under consideration injuries may occur which are small as compared to the injuries occurring at the probe point and as compared to the damages which occur when employing mechanical probes. When using the ion ray probe care should be taken to see that the probe owing to the spaceous diffusion of ion rays has its complete sharpness only on the surface of object layers. At the point of the ion probe the kinetic energy of the ions impinging upon the object causes a local evaporation of the matter so that the ion probe may also be employed for cutting and perforating particles of the object to be tested. The ion probe has the advantage over the electron probe that it can only be employed with an electronic microscope for the combination described below and that the effect is greater.

When performing in practice such manipulations it is desirable to know the point upon which the ion ray probe impinges. To this end, the invention offers a very simple means, since when employing it in connection with the electronic microscope, it may be so designed that the point upon which the ion ray probe impinges can be directly observed in the electron-optically magnified image of the object. In order to enable a manipulation of the above-mentioned kind at a given point of the object, devices are employed according to the invention, by means of which a relative displacement between the object and the point upon which the ion ray probe impinges may be effected. To this end, for instance, the object may be so arranged as to effect a mechanical displacement. Another possibility consists in displacing the ion ray producing device relatively with respect to the stationary object perpendicularly to the axis of the ray. Finally, an electric means may also be employed for deflecting the ion ray for the above-mentioned purposes.

A very simple arrangement may be obtained if the microscope is so designed that the electron rays pass through the object from one direction and the ion rays from the other direction. To enable an observation of the object with the aid of the electronic microscope during the performance of micromanipulations, the path of ray of the electronic microscope is slightly deflected according to the invention behind the microscope objective, preferably behind the projection lens by means of a homogeneous magnetic field. Furthermore, electrostatic lenses are employed as optical systems. Since the ion rays are not appreciably deflected by the homogeneous auxiliary magnetic field, the system for producing the ion rays of a small initial cross-section may be left approximately on the optical axis of the objective so that the canal ray system and the parts of the electronic microscope lying behind the point of deflection are spaced from one another. Since the refraction of electrostatic lenses on electrons and ions is the same provided that the absolute values of the operating voltages of the ion ray source and of the electron ray source are equal also the greatest sharpness of the ion probe in the plane in which the object lies is automatically obtained when adjusting for the greatest sharpness of the electron image.

It is preferable to employ control devices, by means of which the operating voltage of the ion ray producing device may be varied in order to magnify the diameter of the ion probe or to correct faults of compensation of the second order.

With the invention it is, for instance, also possible to perforate holes of submicroscopic fineness in foils in order to obtain filters and to follow at the same time the boring operation in detail with the aid of the electronic microscope. To produce a plurality of filter holes, the canal ray producing device may be so designed that at the same time a plurality of probes may be directed onto the object. To this end, for instance, the electrode from which the canal ray is emitted may be designed in the form of a sieve.

In the accompanying drawing is shown an embodiment of the invention in diagrammatic form.

1 denotes the electron emitting source which is operated, for instance, at a voltage of —40 kV. The electron rays are converged onto an object **3** with the aid of a condenser coil **2**. For the

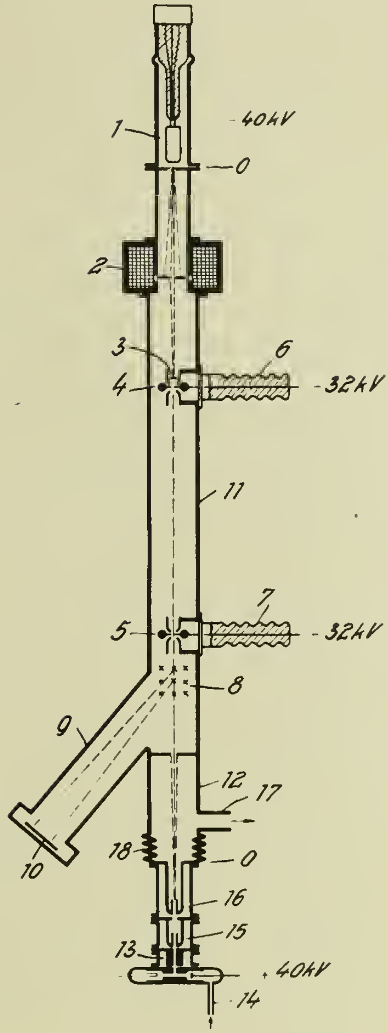
electron-optical magnification of the object two electrostatic lenses 4 and 5 are employed whose voltage bushings are denoted by the numerals 6 and 7. 4 is the objective lens and 5 the projection lens. In the path of the electron rays behind the projection lens 5 is arranged a magnetic auxiliary field winding 8 which serves to deflect the electron rays in such a manner that they fall into the lateral tube 9. The electron-optically magnified image may be viewed on a fluorescent screen 10. The tube 11 of the electronic microscope is extended in the direction of the objective axis as indicated at 12. To the lower end of the microscope is connected the canal ray tube 13 serving to produce ion rays. The current supply conductor for the gas necessary to operate the canal ray tube is denoted by the numeral 14. The canal ray tube is, for instance, operated at a voltage of +40 kV. 15 and 16 denote two acceleration steps for the ion rays. 17 is the pump connection for the electronic microscope. The ion rays are not influenced by the auxiliary magnetic field winding 8; they pass one after the other through the lenses and strike the object 3 in the form of a fine electron ray. The effect of the electron ray may be directly observed with the aid of a fluorescent screen 10. As already mentioned above devices must be employed in order to enable a selection of a point upon which the electron ray impinges on that part of the object to be observed. To this end, the canal ray tube 13 is shifted in a direction perpendicular to the direction of the ray. To enable the tube 13 to be shifted, the latter is secured to the lower end of the tube 12 by the interposition of a resilient body 18.

MANFRED VON ARDENNE.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

M. VON ARDENNE
ELECTRONIC MICROSCOPES
Filed Jan. 28, 1941

Serial No.
376,309



Inventor
Manfred von Ardenne

Knight Bros
Attys.

Published May 25, 1943 Serial No. 376,394

ALIEN PROPERTY CUSTODIAN

APPARATUS FOR THE AUTOMATIC PUTTING ON DIPPING PLATES STYLUS OR OTHER ROD-SHAPED WORKS

Alfred Hetz, Stein near Nurnberg, Germany; vested in the Alien Property Custodian

Application filed January 23, 1941

Automatic apparatus have already become known which serve for putting on dipping plates, stylus or other rod-shaped works. The dipping plates after the works have been put on are fed to a device which dips the works perpendicularly more or less deeply into a corroding-, colouring-, varnishing bath or the like. The apparatus known for this purpose possess the inconvenience, that they operate very slowly, as by the same actually only a single row of the dipping plate can be equipped with works. The dipping plate must then be shifted by the distance between two rows, in order that the next row can be equipped with works. The cost of production of the apparatus is thereby considerably increased and its efficiency is very low.

The present invention has for its object, to considerably accelerate the putting of works onto dipping plates. This problem is solved thereby, that the works are put on simultaneously in several vertical and horizontal rows, so that the whole dipping plate can be charged in one operation. The works are first placed into a feeding hopper and then fed to the dipping plate with the aid of mandrels and a guide plate, in several vertical and horizontal rows. The mandrels are mounted on a reciprocating carriage. It is especially advisable, to arrange feeding funnel, mandrels and guide plates in double, so that at each movement in the one or other direction of the carriage carrying the mandrels a dipping plate is equipped with works.

Guide walls are arranged in the feeding hopper, the distances between said guide walls corresponding to the diameter of the works. By these walls the works are first arranged in vertical rows, the distance between said rows corresponding in the horizontal direction to the distances of the sleeves and of the dipping plates. In order to also ensure the distance in the vertical direction, the selection from the vertical rows of the styluses to be put on is effected by the mandrels, which are spaced the one from the other at a distance which corresponds to at least double the diameter of the pencils or to a multiple of the same. In these distances holes are provided in the wall of the feeding hoppers facing the dipping plates at distances apart corresponding to the distance between the mandrels. Also the wall of this hopper facing the carriage has corresponding apertures. In order to insert the works securely into the vertical rows, the feeding hopper is subdivided and its upper part carries out an oscillating movement. In this upper part oscillating distribution plates are further suspended.

The intermediate walls in the hopper may have oblique indentations into which the styluses slip so that they are spaced the one from the other at the same distance as the sleeves on the dipping plate.

The guide plate arranged behind the feeding hopper on the side facing the dipping plate has a funnel-shaped inlet for the works and a round outlet, which again corresponds to the distance between the sleeves on the dipping plates.

The guide plate is connected by means of a catch device with the carriage carrying the mandrels. The guide plate is drawn along by a catch-pawl up to shortly in front of the dipping plate to be equipped with works, and then securely held, whilst the inserting mandrels still carry out an additional movement and thereby securely stick the works into the dipping plate. On the catch-part for the guide plate mounted on the carriage a stop is provided, which at the extreme end of the movement of the putting-on mandrels releases the locking for the guide plate, so that this plate is returned into its initial position under the action of a pull spring. On the dipping plates the row for holding the works is constructed preferably sleeve-like, and the dipping plates are brought to in front of the guide plate from the side of the machine.

An embodiment of the invention is illustrated by way of example in the accompanying drawings, in which

Fig. 1 shows the machine in side elevation, the carriage being in the middle position,

Fig. 2 is a similar view as Fig. 1 the guide plate being pushed forward,

Fig. 3 is a top plan view of Fig. 1,

Fig. 4 is a section on line IV—IV of Fig. 1.

Fig. 5 is a section through the feeding hopper on line V—V of Fig. 2.

Fig. 6 shows an other form of construction of the inner space of the feeding hopper,

Fig. 7 shows the guide piece in elevation viewed from the side at which the feeding hopper is provided,

Fig. 8 shows the guide piece in elevation viewed from the side at which the dipping plates are arranged,

Fig. 9 is a section on line IX—IX of Fig. 7.

Fig. 10 shows a dipping plate in top plan view,

Fig. 11 is a part section through a dipping plate.

In the figures of the drawings 1 designates the base plate of the machine, in which plate a hy-

draulic drive 2 for a carriage 3 is accommodated, said carriage carrying on either side mandrels 4. On the base plate 1 vertical guide bars 5 are mounted, in which dipping plates 6 slide. On the base plate 1 two feeding hoppers 7 are further arranged which consist each of a stationary part 8 and of an oscillatably arranged part 9, the latter part being oscillated for instance by means of a crank drive 11 driven by a motor 10.

In the lower part 8 of each hopper 7 guide plates or partitions 12 are arranged, the intervals 13 between said guide plates corresponding to the thickness of the works, for instance of the pencils 14. The wall of the hopper facing the dipping plates has holes 15, the distance between said holes amounting to a multiple, at least to double the diameter of the works to be put on.

In the hoppers oscillatable plates 16 are further arranged, which are mounted in slits 17 of the movable part 9 of the hopper and ensure a uniform distribution of the poured in works.

The partitions 12 may have obliquely directed grooves 18, as shown in Fig. 6, into which the pencils slip, so that they are brought to in front of the holes 15.

The feeding plates 21 are slidably arranged by means of guide bars 19 guided in guide pieces 20 on either side of the stationary hopper part 8. These feeding plates 21 are pressed by springs 22 against the corresponding hopper part 8. Catching bars 23 are further provided on the carriage 3 and have on their front end pawls 24 adapted to engage into the notches 25 in the guide bars 19 when the carriage is moved, and to thereby carry along the guide bars 19 and the guide plates 21. This catching movement lasts until locking pawls 26 fixed on the hopper part 8 engage into notches 27 in the lower side of the guide bars 19. The catch pawls 24 are at the same time lifted out of the notches 25 when rollers 35 of the catch pawls 24 run up on control faces 28, so that the guide plates 21 are securely held in this position, as shown in Fig. 2. When the movement of the carriage continues, only the mandrels 4 with the works 14 are then conducted in the direction to the dipping plates 6, until stops 29 fixed on the catch-bars 23 release the locking pawls 26. By the action of spring 22 the corresponding guide plate 21 is then returned into its position of rest shown in Fig. 1.

The guide plates 21 have oblong insertion holes 30 on the side at which the works are inserted, said holes merging through bores 31 funnel-shaped into the front openings 32.

The dipping plates have resilient sleeves 33, as shown in Fig. 10, and these dipping plates 6 are brought by the guide bars 5 into the position in which the putting on of the works takes place. The dipping plates may be fed to the putting on place either mechanically or by hand.

It is advisable to pile up the dipping plates under tension for instance of springs 34.

ALFRED HETZ.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. HETZ

APPARATUS FOR THE AUTOMATIC PUTTING ON DIPPING PLATES STYLUS OR OTHER ROD-SHAPED WORKS

Filed Jan. 28, 1941

Serial No. 376,394

3 Sheets-Sheet 1

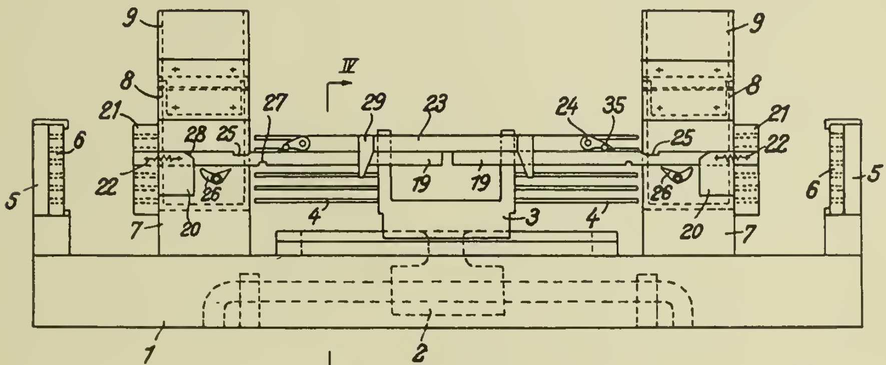


Fig.1

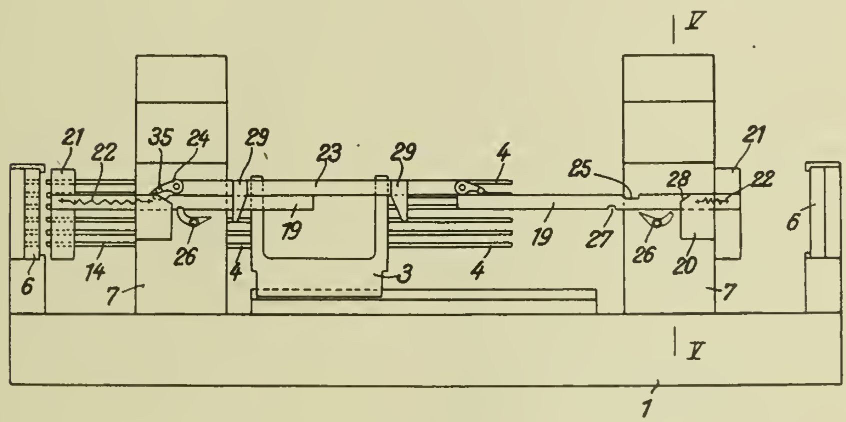


Fig.2

Inventor:
A Hetz

By: Glascock Downing & Seebold
Attys.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. HETZ
APPARATUS FOR THE AUTOMATIC PUTTING ON DIPPING PLATES STYLUS OR OTHER ROD-SHAPED WORKS
Filed Jan. 28, 1941

Serial No. 376,394
3 Sheets-Sheet 2

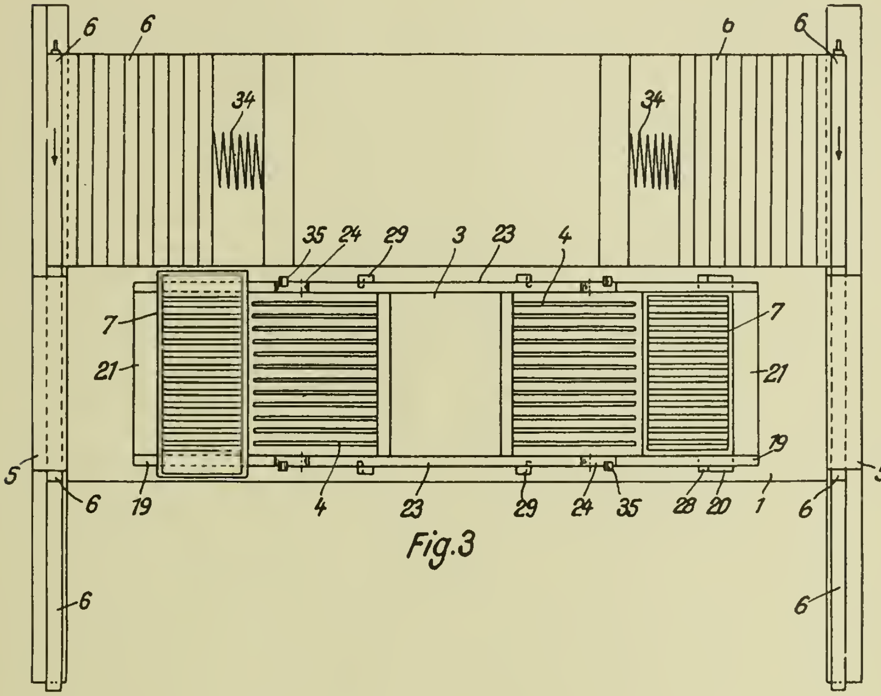


Fig.3

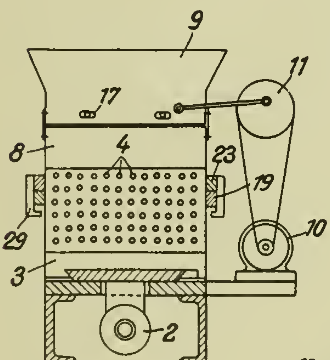


Fig.4

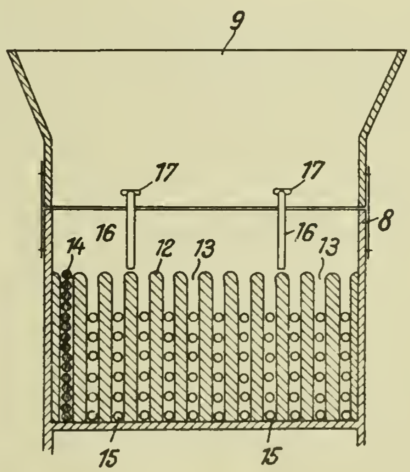


Fig.5

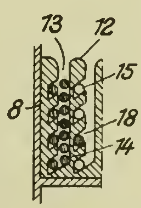


Fig.6

Inventor:
A. Hetz
By Glascock Downing & Seebold
Attys.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. HETZ

APPARATUS FOR THE AUTOMATIC PUTTING ON DIPPING PLATES STYLUS OR OTHER ROD-SHAPED WORKS

Filed Jan. 28, 1941

Serial No. 376,394

3 Sheets-Sheet 3

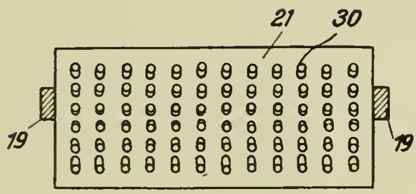


Fig.7

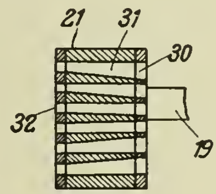


Fig.9

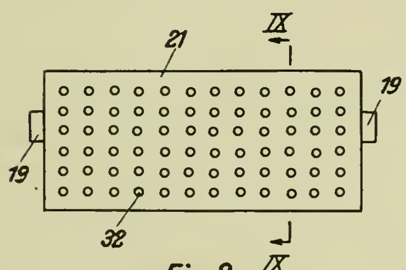


Fig.8

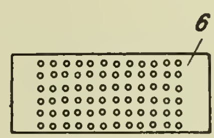


Fig. 10

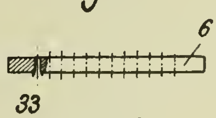


Fig.11

Inventor:

A. Hetz

By: Glascock Downing & Seebold

Attys.

Published May 25, 1943

Serial No. 376,576

ALIEN PROPERTY CUSTODIAN

MICROSCOPE

Eugen Oskar Bernhardt and Werner Bischoff, Jena, Germany; vested in the Alien Property Custodian

Application filed January 30, 1941

The invention relates to a microscope for determining the hardness of a substance, the microscope containing an indentation body of hard material for producing impressions in the substance under investigation and a device for measuring such impressions, the indentation body being elastically attached to the microscope in the direction of the optic axis of the objective by means of a spring whose purpose it is to create a test load.

According to the invention the microscope is equipped with an optical test load-indicating device consisting of a scale in fixed position and of an optical system connected with an indentation body and containing at least one reflecting member. With the aid of the optical system the scale is being imaged in the ocular image-plane and the spring-action occasioned when the indentation body rests on the substance to be tested indicated by means of a pointer which is either provided for in the ocular image-plane or which is connected with the indentation body and moves pass the scale. The pointer may also be provided in fixed position and the scale movable.

In order to be able to adjust the scale relative to the pointer and in respect of its distance from the imaging system, it will be of advantage if the scale is adjustably disposed be it in the direction of the optic axis of the objective or at right angles to that direction.

Primarily in the case of metallographical and mineralogical investigations where the hardness is to be determined of large and small crystals lying next to each other, the optical test load-indicating device affords the advantage to employ, without the previous manipulation of adjusting elements, the test load required for the respective crystal and to constantly keep the observer informed of what test load is being employed at the respective moment.

A constructional example of the invention is illustrated in the annexed drawing, part of which shows a longitudinal section containing the axis of the objective.

By means of two annular springs **1** and **2** the mount **3** of a microscope objective is elastically mounted to a supporting body **4** in the direction of the optic axis X—X of the objective. On the front lens **5** of the objective an indentation body **6** is seated by means of which impressions are produced in the substance under investigation, while the rear lens **7** carries a prism **8** which is fastened by means of a pin **10** seated in the prism mount **9** and engaging a boring provided for in the rear lens. The surface **8'** of prism **8** is coated with a reflecting layer. On the mount **9** a collective lens **12** is seated in a second mount **11**. With the aid of said collective lens **12** the scale **14**, which is provided for on a glass plate **13** and which runs parallel to the optic axis of the objective, is imaged in the ocular image-plane of the microscope. In this image-plane a glass plate **28** is disposed provided with a pointer **27** which latter, for reading purposes, indicates on scale **14** the test load which is produced when setting the indentation body **6** upon the substance to be tested. The scale **14** is displaceable both in the direction of the optic axis of the objective when the zero point is to be set, or at right angles to said direction when the scale is to be sharply focused in the ocular image-plane of the microsope. For this purpose the glass plate **13** is attached to a tube-stud **15** which is prevented from rotating by a bolt **17** which is mounted on the supporting body **4** and protrudes into a slot **16** running parallel to the axis of said tube-stud. The latter is provided with external thread upon which a ring **18** is seated which, via an intermediate ring **19**, is so disposed on the supporting body **4** that it cannot be displaced in the direction of the optic axis of the objective. By means of an adjusting collar **20** the ring **18** can be slewed from the outside via a dog **21**, thus resulting in an axial displacement of the tube-stud **15**. Also the ring **19** can be slewed from the outside via a dog **23** by means of an adjusting collar **22**. The bore of ring **19** lying eccentrically to the convex surface of said ring, so that the axis Y—Y of the bore does not coincide with the axis of the rotating body determined by the convex surface of the ring, it will be possible, by slewing the ring **19**, to cause a movement of tube-stud **15** in a direction at right angles to the optic axis X—X of the objective thus effecting the scale to be sharply focused. For the dog **21** or **23**, respectively, a traverse slot **24** or **25**, respectively is provided for on the supporting body **4**. By means of an intermediate piece **26** the supporting body **4** must be imagined to be attached either to a changing device provided for on the microscope tube or to be attached directly to the microscope tube.

The indentation body can also be so disposed that it is mounted in place of the lens-mount **3** either direct or in a special holding body. In this case the supporting body **4** and the objective must be imagined to be separately of each other attached to a changing device which so permit to actuate the indentation body that the latter acts in the direction of the optic axis of the objective, and that an impression can be produced in the testing object at a point previously selected with the aid of the objective, whereupon, by interchanging the indentation body, said impression can be observed and measured through the objective of the microscope.

EUGEN OSKAR BERNHARDT.
WERNER BISCHOFF.

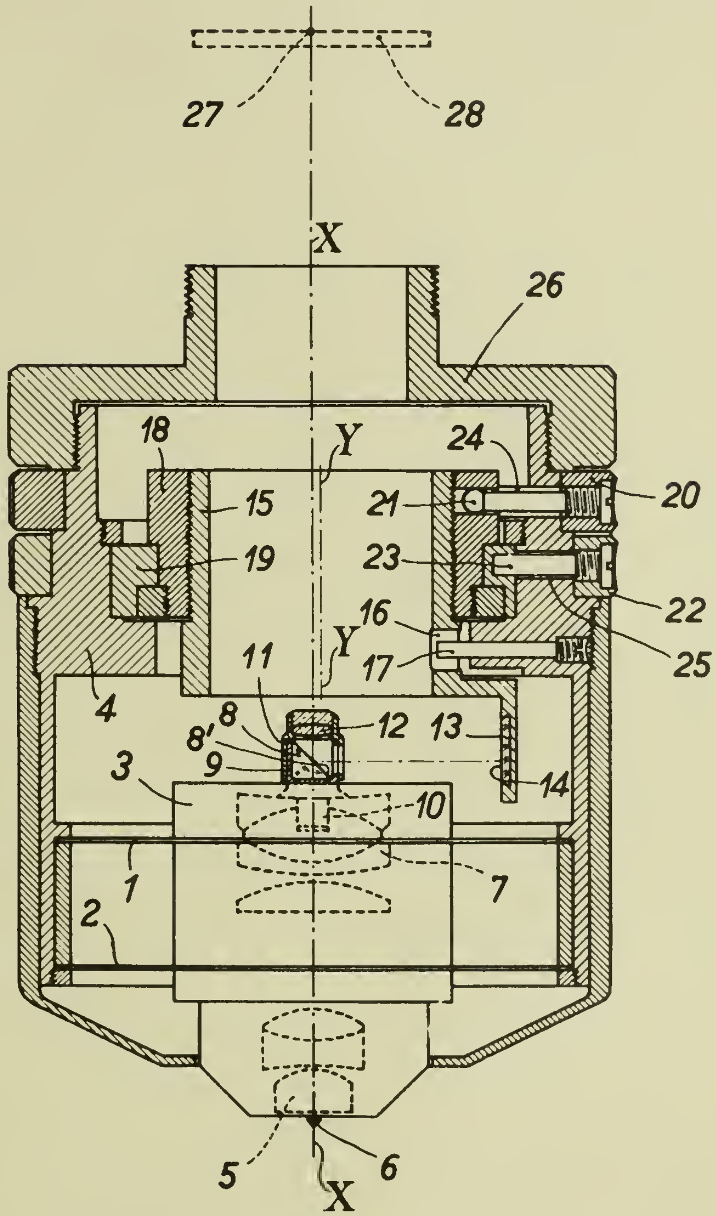
[illegible]

[illegible]

PUBLISHED
MAY 25, 1943.
BY A. P. C.

E. O. BERNHARDT ET AL
MICROSCOPE
Filed Jan. 30, 1941

Serial No.
376,576



Inventors:
Eugen Oskar Bernhardt
Hermann Lipsoff

Published May 25, 1943 Serial No. 376,930

ALIEN PROPERTY CUSTODIAN

DEVICE FOR DISSOCIATING THE ELECTRIC CHARGES OF A GAS OR OF A GASEOUS MIXTURE

Aristide Peycelon and Paul Malsallez, Paris, France; vested in the Alien Property Custodian

Application filed January 31, 1941

The present invention has for object a device serving to dissociate the electric charges of a gas or of a gaseous mixture in order to obtain an outflow of gas solely constituted by well defined positive or negative charges for any industrial and biological utilisation.

This device comprises a chamber through which the gas or mixture of gases passes at a definite speed, for instance under the action of a pump or turbine the speed of which is adjustable, and in which it is subjected to a continuous action for dissociating the electric charges existing in the midst of said gas or mixture of gases at the moment it is measured.

Said dissociation can be caused for instance under the action of the α particles of radium or of any other physical element allowing the electric structure of a gaseous molecule to be modified.

The device comprises for that purpose various adjusting and control means.

Furthermore, it essentially comprises means for producing in the dissociating chamber an electric field of definite direction and potential in order to impart to the positive or negative charges formed a speed of suitable magnitude.

Fig. 1 illustrates a general view of the device.

Fig. 2 shows, on an enlarged scale, the dissociating chamber with the apparatus placed at its inlet and at its outlet.

Figs. 3 and 4 show two embodiments of the device according to the invention.

1 designates a cylindrical chamber having conducting walls. One of its ends is connected by a conduit **2** to the delivery of a turbine **3** which is fed from one or more sources of gas and through the medium of one or more cocks **4** serving to adjust the outflow and the feed pressure. A filtering partition **5** prevents foreign bodies from entering the chamber **1**. The other end of the latter is electrically insulated from the chamber **6** arranged as an extension thereof and connected through the medium of a diaphragm **7** to an outlet pipe **8** with a cock **9** and nozzle **8a** the shape of which can vary according to the applications. The diaphragm **7** and the cock **9** cooperate for adjusting the outflow of the gas.

10 illustrates the dissociating element which is constituted, in this example, by a sleeve placed within the chamber **1** concentrically with its walls and in mechanical and electrical contact with the latter, said sleeve being covered with a radio-active substance for instance.

A wire **11**, perfectly insulated from the walls of said chambers is arranged according to the axes of chambers **1** and **6**.

The electric assemblage comprises, in this example:

An electric motor **12** for actuating the turbine **3**, a source of current **13**, a rheostat **14** for adjusting the power of said motor and a voltmeter **15** for the control;

A source of current **16**, one of the poles of which is connected to earth, and the other to the wall of the chamber **1**, through the medium of a reversing switch **17**, so that the chamber can be brought to a positive or negative potential at will; a voltmeter **18** indicates the value of said potential;

A thermionic valve device **19** only partly shown, serving to measure the electric dissociation of the gaseous molecules; the filament of said valve is connected to a battery **20** of 6 volts for instance, through the medium of a rheostat **21**, one of the grids is connected to the wire **11**, another is connected, through the medium of a milliamperemeter **22**, to a pole of a battery **23** of 120 volts, the other pole of which is connected to earth through the medium of an adjusting potentiometer **24**;

An adjustable heating device comprising a resistance **25** which is placed in the pipe **8** for heating the issuing gases, a battery **26** feeding said resistance and a rheostat **27** adjusting the intensity of the heating current.

28 designates the object to be treated, of organic or other origin, which is to be subjected to the action of the jet of gas, said object being connected to earth.

The gases or gaseous mixtures used, delivered by the turbine **3** into the conduit **2** and passing through the filter **5**, reach the chamber **1**, brought to a certain potential relatively to the earth potential; they are then subjected to the action of the dissociating element **10** in such a manner that, according to the polarity applied to the chamber **1**, only electric charges of the same polarity as that of chamber **1** remain in the gas or gaseous mixtures. The speed of displacement of said charges is proportional to the magnitude of the potential applied to the chamber **1** relatively to the earth potential. The reversing switch **17** allows of reversing the polarities used.

The intensity of the dissociation can be measured, at every instant, by means of the thermionic valve device **19** the operation of which is proportional to the quantity of the charges dissociated and to their polarity relatively to the

earth potential, which charges are collected by the wire 11.

Owing to this control means and to the adjusting rheostat 14 the outflow of the positively or negatively charged gases issuing from the nozzle 8*a* can be exactly adjusted according to requirements. On the other hand, their temperature can be adjusted by means of the rheostat 27.

It is to be understood that the invention is not limited to the embodiment above described and that, without prejudice to its principle, the various members illustrated may be replaced by any other substantially equivalent members; for instance, the batteries or cells can be replaced by a source of alternating current, in this latter case with the aid of rectifiers; use can be made of any dissociating means other than radio-active substances, the device 19 can be replaced by any other control or optical, sonorous or like recording device.

It is to be noted that two or a plurality of devices according to the invention may be used simultaneously, one supplying the positive charges, another the negative charges, so that a mixture of gases containing positive and negative charges in an exactly determined proportion can be caused to act on the object to be treated.

The improvements which will be described hereinafter are intended, firstly, as in the preceding case, to form in the midst of the apparatus, positive or negative charges arising from solid, liquid or gaseous bodies and to eject them so that they can be utilised; secondly, to obtain solid, liquid or gaseous products, arising from elements which have an initial chemical composition different from that which these same elements would have after they have been exposed to the action of suitable physical agents. The products which have just been mentioned are obtained either by mechanical action, friction for instance, or by physico-chemical action, which implies a transformation of the atomic structure under the influence of certain definite radiations and electric potentials, as well as under the influence of suitable magnetic fields of definite value and direction. They are chemically pure, possess a chemical constitution different from the body which gave rise thereto and a predetermined polarity.

In Fig. 3, 1 is the dissociating chamber of cylindrical shape, which has for instance a radio-active film 10 in electric connection with the elements 16, 17 and 18. 3 designates the circulating system of the gaseous stream, comprising a turbine or any other device electrically connected at 12—13—14 and 15. 5 designates a filter. 6 is a control chamber in which is arranged an electrode 11, suitably insulated and electrically connected to the members 19, 20, 21, 22, 23, 24 and to 8, 8*a*, 9 and 28. 7 designates the member for adjusting the gaseous outflow to be used. 28 is an earth connection.

At 30 is shown a delivery chamber which is provided with screens adapted to canalize the gaseous outflow. For that purpose, a fixed partition 31 carries channels 44 and supports, through the medium of the spindle 46, a rotating plate 32 perforated with channels 41 identical to the channels 44.

33 designates an insulated electrode electrically connected by 42 to the source of electric energy 43. The chemical nature of said electrode is function of the results to be obtained.

34 illustrates a fixed chamber for regularizing the gaseous outflow, and which may be provided with a radio-active film 47.

The elements 34, 31 and 30 are suitably connected by a fixed support 35.

A toothed crown wheel 36 mounted on a shaft 37 produces the rotation of the plate 32. A timed relay 38, operating under the action of direct or alternating current 45 controls an electric motor, or a clockwork, or a pneumatic or hydraulic device, not shown, which actuates the plate 32 through the medium of members 36 and 37 and can actuate or not the circuits 16, 17, 18, during a predetermined time.

In Fig. 4, 40 designates a chamber filled with a liquid or with solid bodies in suspension, or with a gas or a gaseous mixture; said chamber is provided with a radio-active film 48 subjected to a certain potential by 42—43 relatively to earth 28. Said device 40 can be mounted in the place and stead of chamber 1 of Fig. 1.

The chambers 1, 34, 40 can also be filled with a gas or gaseous mixture the atomic structure of which is to be modified by the processes used for solid or liquid bodies. The source of electric energy 43 is adapted to bring the electrode 33 and chamber 40 to a certain potential of definite value and polarity relatively to the earth potential.

The operation takes place as follows:

The timed relay 38 controls at predetermined and definite intervals of time the rotation of plate 32 opposite the fixed partition 31. This rotation is adapted to put the channels 41 and 44 in or out of communication, that is to say to prevent or allow the passage of the gaseous stream coming from the turbine 3.

This gaseous stream passes through the filter 5, proceeds towards the chamber 34 for adjusting the outflow, then towards the physico-chemical transformation chamber 40 or 1, and from there it reaches the control chamber 6.

When passing through the chamber 34 the gas is subjected to a first action of radiations arising from the radio-active film 47. When passing through chamber 1 or 40 it is subjected to a second radio-active action which completes and terminates the transformation of the charges by imparting thereto a definite polarity. Moreover, in said chamber 1, the electrode 33 brought to a certain potential by the source of energy 43 (which potential can be positive or negative) being subjected to radiations emitted by the radio-active film 10, a physico-chemical transformation of the surface of the electrode results therefrom. The products of this transformation, the nature of which will be function of the initial chemical composition of said electrode, will be of negative or positive polarity according to the polarity of the potential applied to said chamber 1. This transformation takes place during the obturation of the channels 44 by the rotation of plate 32 provided with the channels 41. The duration of the obturation which has just been mentioned, will be function of the initial chemical nature of the electrode 33 and can therefore vary according to the results to be obtained and the elements used. Said obturation period, that is to say of transformation of the surface of electrode 33, will be adjusted through the medium of the timed relay 38. As soon as the communication between chamber 30 and chamber 34 is reestablished, fresh gaseous elements arising from the turbine 3 will take the place of the preceding ones and the first will be ejected in order to be

used, at the same time as the products obtained from the physico-chemical transformation.

When chamber 40 of Fig. 4 is substituted for chamber 1 of Fig. 1, physico-chemical transformations similar to those to which the gases and solids are subjected in the apparatus of Fig. 1, are produced in the liquids or other bodies in suspension in said chamber 40. Said products will also be brought to positive or negative potentials according to the polarity of the film 48 relatively to the earth potential. The ejection will take place as in the case of chamber 1.

It is to be understood that said physico-chemical transformation can be a surface or a complete transformation according to the conditions of operation.

In chambers 1 or 40 within which the desired physico-chemical transformations take place, it is advantageous in certain cases to introduce a heating resistance, not shown. This resistance, electrically raised to a suitable temperature produces a mechanical atomization of the electrode, which has the effect of increasing the rapidity of the physico-chemical transformation under the action of the rays from the radio-active film. The products of said physico-chemical transformation are of negative or positive polarity according to the polarity of the potential applied to chamber 1 or 40 and are ejected towards the exterior, to be used, as indicated in the preceding paragraphs.

On the other hand, the electrode to be heated can be mounted in a separate compartment, the atomized particles being sent into the radio-active chamber in order to enter into the predetermined circulation, after the chamber 6 has been controlled by the electrode 11.

It is to be noted that all these devices can constitute a portable unit for any industrial, biological or other utilisation.

It is to be understood that the shape, mutual locations, dimensions of said devices can be modified without affecting the principle of the invention which constitutes in itself a new industrial product.

ARISTIDE PEYCELON.
PAUL MALSALLEZ.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

A. PEYCELON ET AL

DEVICE FOR DISSOCIATING THE ELECTRIC CHARGES OF A GAS OR OF A GASEOUS MIXTURE

Filed Jan. 31, 1941

Serial No. 376,930

2 Sheets-Sheet 1

Fig. 1.

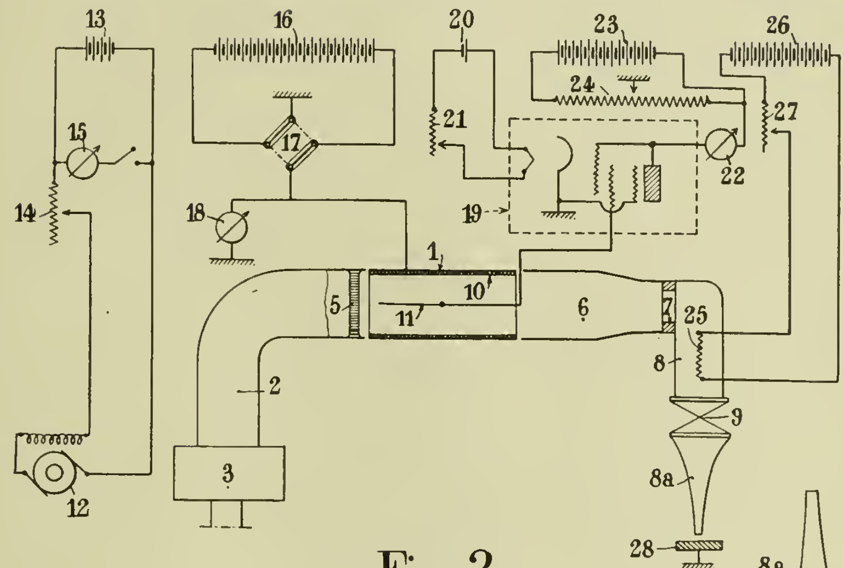
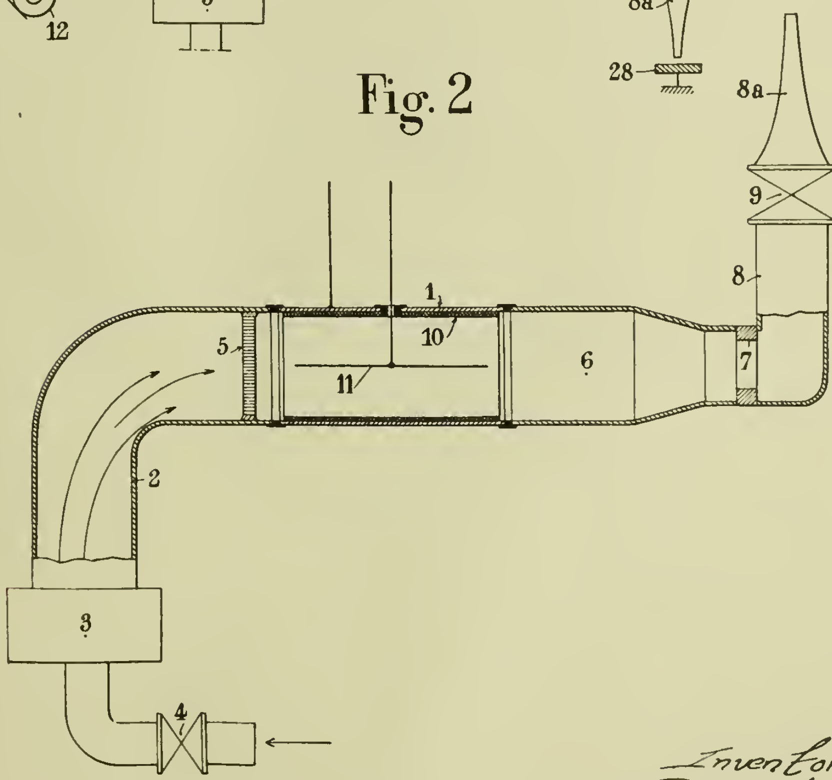


Fig. 2



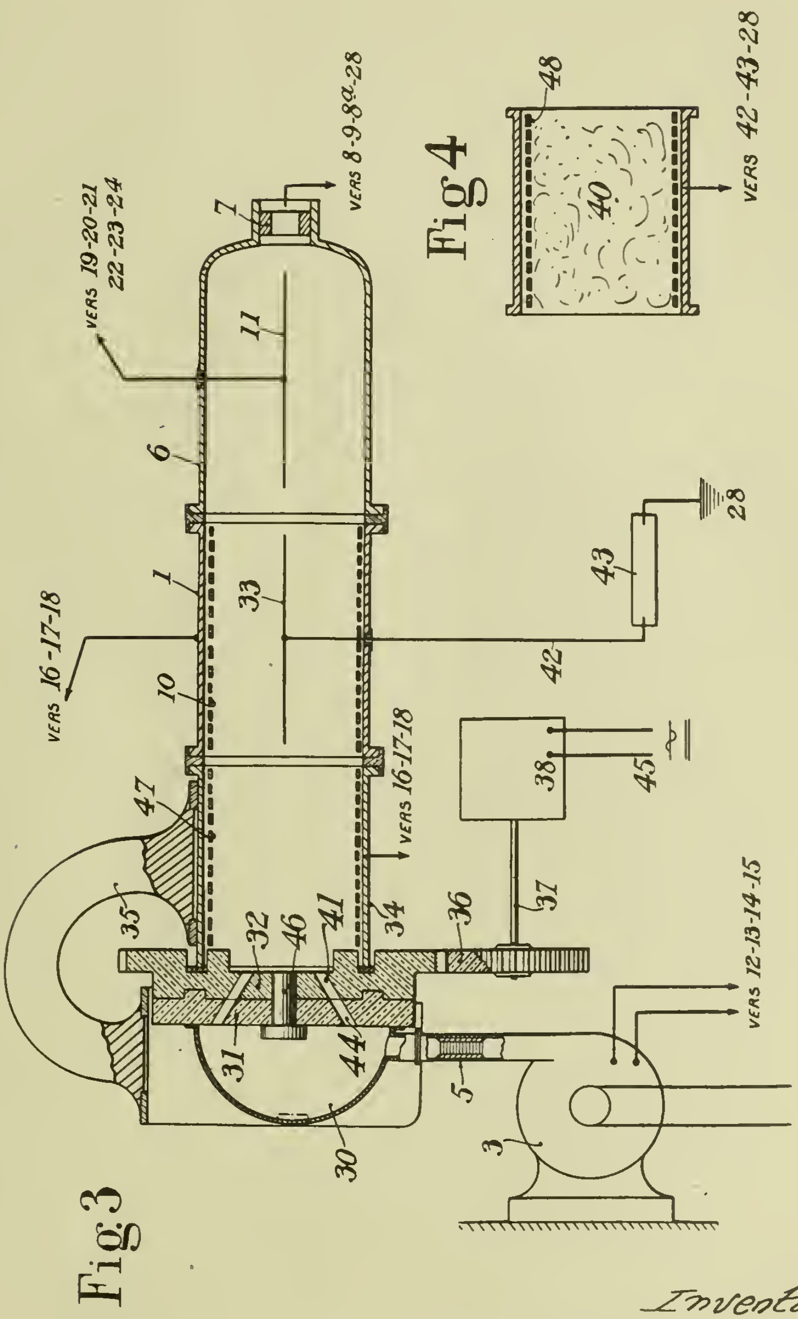
Inventors
A. Peycelon &
P. Malsallez

By: Glascock Downing & Seebold
Attys

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. PEYCELON ET AL
DEVICE FOR DISSOCIATING THE
ELECTRIC CHARGES OF A GAS
OR OF A GASEOUS MIXTURE
Filed Jan. 31, 1941

Serial No.
376,930
2 Sheets-Sheet 2



Inventors,
A. Peycelon &
P. Malsallez
By: Glascock Downing & Seebold
Attys.

Published May 25, 1943 Serial No. 377,704

ALIEN PROPERTY CUSTODIAN

MULTI-STAGE COMPRESSORS

Wilhelm Weimar, Berlin-Siemensstadt, Germany; vested in the Alien Property Custodian

Application filed February 6, 1941

This invention relates to a turbine-like multistage compressor with radial admission of the working fluid, provided with intermediate cooling.

The work of compression in a compressor is, as is well known, the smaller, the more the curve of compression approaches the isothermal curve. The coincidence of the compression curve with the isothermal curve is the more difficult to bring about, the greater the number of stages of the compressor, which is particularly the case in turbine-like compressors with radial admission of the working fluid. Here the number of stages is so great and the dimensions of the blade are so small that the intermediate cooling cannot be practically carried out when employing hollow blades or similar means. There is no other remedy than to provide an intermediate cooling, for instance, between two stages. The object of the invention is therefore to suitably arrange the cooler within the compressor, particularly within a turbine-like multi-stage compressor with radial admission of the working medium and whose blades are subdivided into a plurality of rows of blades which are traversed one after the other by the working fluid. In this case the cooler or coolers of substantially the circular type are arranged in the by-pass space provided between two blade rings.

In the accompanying drawings is shown an embodiment of the invention in diagrammatic form, in which

Fig. 1 shows a longitudinal view and Fig. 2 a lateral view, partly in section.

In this turbine-like compressor with radial admission of the working fluid, the blading is subdivided into a plurality of blade groups **1**, arranged on the shaft **3** at both sides of the discs **2** and traversed one after the other by the air to be compressed in the direction as indicated by the arrows. Between these two rows of blades is provided an intermediate cooling, i. e., the intermediate coolers are arranged in the by-pass spaces **4** and **5** between two rows of blades. The great advantage of such an arrangement lies in the fact that the compressed air on its way from one group of blades to the other may flow directly through the cooler without encountering appreciable resistances. A reversal of the compressed air is necessary between two groups of blades so that as the only additional loss there results in the cooler itself the loss due to the resistance to flow. However, the loss may be reduced to a minimum by suitably dimensioning the blades and by a suitable choice of the velocity of flow.

Since in the case of coolers certain damages and pollutions must always be reckoned with, it is preferable to subdivide the cooler into a plurality of individual segments which may be arranged in parallel or series and which may be separately removed without great difficulties in order to clean and to replace the same.

WILHELM WEIMAR.

PUBLISHED

MAY 25, 1943.

BY A. P. C.

W. WEIMAR

MULTI-STAGE COMPRESSORS

Filed Feb. 6, 1941

Serial No.

377,704

Fig. 1

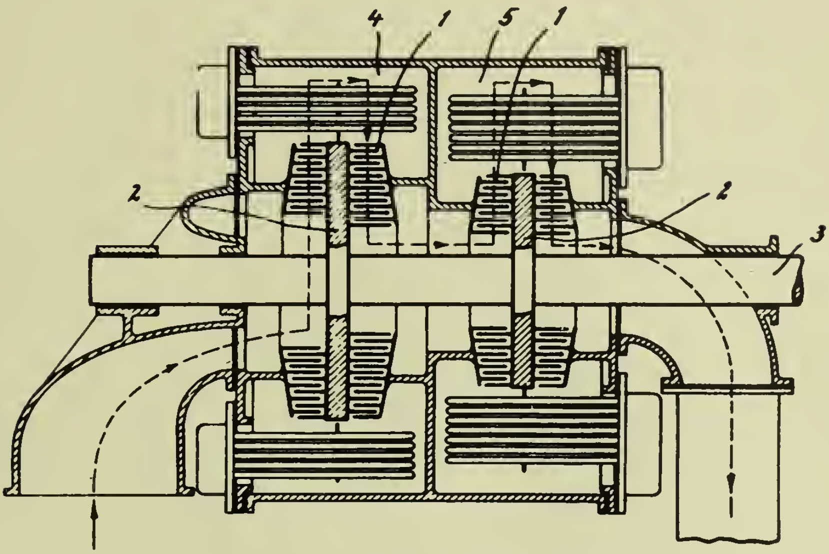
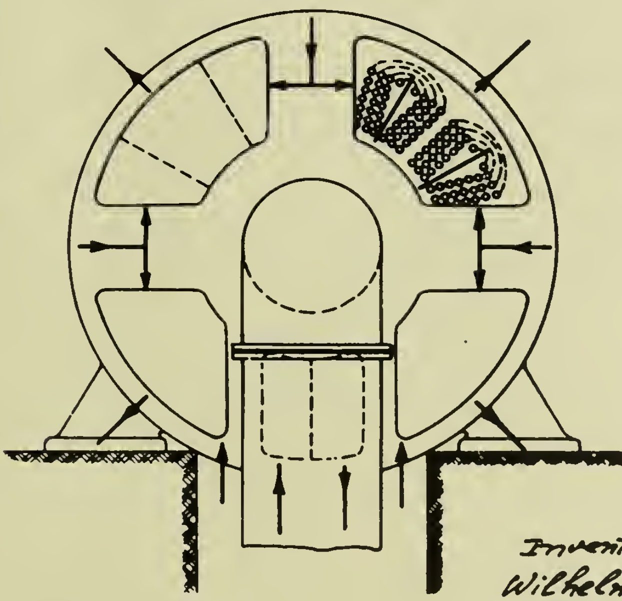


Fig. 2



Inventor:
Wilhelm Weimar
By Richardson & Auer
Att'ys

Published May 25, 1943 Serial No. 377,299

ALIEN PROPERTY CUSTODIAN

ELECTRON TUBES

Rudolf Scharfnagel, Stuttgart, Germany; vested in the Alien Property Custodian

Application filed February 4, 1941

Electron tubes when employed for high power entail the difficulty that a great quantity of heat must be conducted away from the electrodes. In the case of tubes having a metal bulb this bulb usually serves as anode and thus insures comparatively good heat radiation.

Tubes of this kind are desired to be as small as possible and yet to be suitable for high power. The high temperature acquired by the bulb or anode may happen to exceed the softening temperature of the glass seal by which the cover for the bulb and the current leads mounted in the cover are secured to the bulb, and in such case can endanger the seal.

According to the invention a cooling device made of a light metal is inserted over the bulb and positioned near the seal, as will be understood from the following description and the accompanying drawing, in which

Fig. 1 is a sectional view of an example of electron tubes as provided by the invention, Fig. 2 is an end view of the cooling device.

The tubular metal bulb is designated 1. 2 denotes the cooling device, 3 the seal.

The cooling device **2** is shown to cover part of the bulb but may be arranged to cover the entire surface thereof. The cooling device acts to protect the seal **3** from softening on the bulb becoming hot. The load capacity of the electron tube hence is greater than heretofore.

The cooling device **2** can be shrunk onto the metal bulb or may be fixed to it in any other suitable manner, and it is made of a light metal of the kind having a very good heat conductivity and a high heat radiation. The cooling device hence may be comparatively small and may be accommodated in shape to the bulb, or may be given any other desirable form. Since furthermore the cooling device may be located near the seal **3**, electron tubes of the novel construction may be very small. Also, two or more sealing operations may be effected one after another and in the neighbourhood of each other without interfering with one another.

It has been found that the cooling action is particularly good if the cooling device **2** is a tubular body or ring A formed with cooling fins or vanes B which are longer than this ring, so that each vane B in part freely extends along the bulb, as will be seen in Fig. 1. Preferably, the bulb is somewhat conical at the zone where ring A is shrunk onto it. Ring A may be short as shown because the cooling device is made of a material to which a good heat conductivity is peculiar and which therefore requires only a comparatively small part of the device **2** to contact with the bulb.

This material may be a magnesium alloy designated as "Elektron" and which has proved to be most suitable for this purpose, as it is easy to tool and mouldable by die casting, thus saving material.

RUDOLF SCHARFNAGEL.

PUBLISHED MAY 25, 1943. BY A. P. C.

R. SCHARFNAGEL
ELECTRON TUBES
Filed Feb. 4, 1941

Serial No. 377,299

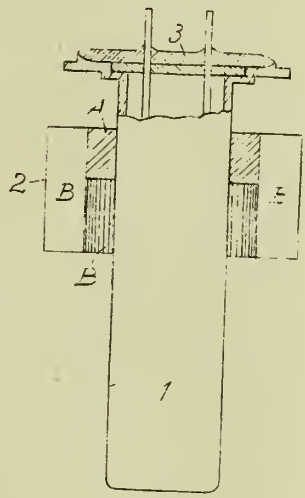


FIG. 1

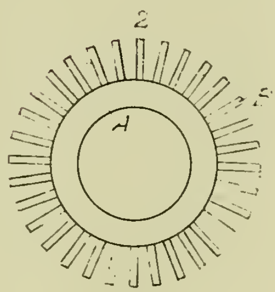


FIG. 2

Rudolf Scharfnagel
by
Att'y

INVENTOR

BY E.H. Grimes

ATTORNEY

Published May 25, 1943

Serial No. 377,395

ALIEN PROPERTY CUSTODIAN

GRAVITY METER

Anton Graf, Berlin-Steglitz, Germany; vested in the Alien Property Custodian

Application filed February 4, 1941

It has previously been proposed to construct gravity meters in which the displacement caused by variations in gravity of an elastically supported mass serves to control the exposure of photo-cells arranged in differential connection. In such optic-electric gravity meters a preferably perforated diaphragm capable of being displaced together with the mass is displaced relative to a fixed diaphragm, by which means the exposure of a photo-cell system is varied so that the difference between the photo-cell currents (voltages) is a measure of the mass displacement and the gravity variation, respectively. The present invention relates to the constructive development of such an instrument for rendering it suitable for field use.

One of the principal considerations in the construction of such instruments is that of eliminating any temperature influence from the heat producing sources of light upon the extremely temperature-sensitive parts of the instrument, i. e. the photo-cells and the suspension spring.

According to the invention such protection against temperature influences is facilitated by arranging the photo-cells back to back in the interior of the instrument so as to be capable of exposure to sources of light arranged outside of said instrument.

A further point to be considered is, however, that the photo-cells in the interior of the instrument, and particularly the diaphragms between these and the sources of light, are easily and accurately adjustable. For this purpose they are arranged in such manner that a perforated diaphragm each is secured so as to be turnable and vertically displaceable in front of each photo-cell, a similarly perforated second diaphragm being suspended in front of said first diaphragms.

The mounting of the inner diaphragm may in this connection be firmly connected with that of the respective photo-cell and is preferably guided in a recess of a slide gliding in turn in a vertical guide of a frame-like support. In this way it is possible to adjust the fixed diaphragm by means of turning and vertical displacement into a desired position relative to the diaphragm secured on the mass, and more particularly to align the two diaphragms.

It is, however, necessary likewise to provide for the possibility of adjusting the movable diaphragms, as will be seen from the following. The instruments are constructed so as to indicate a measuring value when the parallel adjusted diaphragms are displaced relative to one another in the plane which is normal to the plane determined by the perforation and the source of light. Such a relative displacement into the normal to said plane may however take place also at an inclination of the instrument and thus falsify the measurement. Hence it must be rendered possible to align the movable diaphragms in all directions in such a way that an inclination of the instrument does not result in a displacement of the movable diaphragm into the normal to the plane determined by the perforation and the source of light. The proper position of the movable diaphragm most adequately fulfilling this condition cannot be previously determined but has to be ascertained in practice by means of adjustment. In order to provide such universal adjustment of the movable diaphragms it is advantageous to connect the diaphragms rigidly with the mass and to fix the mass at a clamping member at any desired inclination to the spring axis, said clamping member being arranged at one end of the suspension spring. Such an arrangement is constructionally much simpler than that of having the diaphragms fixed to the mass so as to be universally adjustable, although in principle this may serve equally well. A further possibility of adjustment may be provided by arranging the sources of light so as to be adjustable vertically relative to the first diaphragms. By vertical displacement of the incandescent lamp the plane determined by the source of light and the diaphragms may be displaced and more easily aligned when movements of the movable diaphragms occur due to an inclination of the instrument.

An embodiment of the invention is described in the following, reference being had to the accompanying drawing representing a vertical section through the instrument.

In a casing 1 there is suspended at a spiral spring 2 a mass 3 of a gravity meter. Said mass is fixed at the spring 2 by means of a mounting appliance 4 possessing a spherical surface 5 serving as support for the mass 3. By means of four adjusting screws 6 the mass 3 may be mounted so as to be universally inclined relative to the spring axis. A support 7 is inserted in the casing 1, two frames 9, 29 being fixed on said support by means of screws 8. Two further frames 10, 30 are slidably arranged in vertical guides in the frames 9, 29, respectively, the frames 10, 30 serving as supports for the photo-cells 11, 31, respectively. Said photo-cells are arranged back to back with their light-sensitive front part turned outwardly. They are arranged in differential

connection and are in communication with a galvanometer 35. In front of each photo-cell there are disposed—in respective recesses 13, 33 of the slides 10, 30 carrying the photo-cells 11, 31, respectively—diaphragms 12, 32, respectively, and in such manner as to be turnable in the respective slides 10, 30 as well as displaceable in the respective frames 9, 29. Screws 14 serve to secure the respective diaphragms 12, 32, and set screws 15 and countersprings 16 are provided to fix the slides 10, 30, respectively.

A second pair of diaphragms 17, 27 is arranged in front of the diaphragm pair 12, 32, respectively. The former is however rigidly connected with the mass 3. The diaphragms 17, 27 are universally inclinable together with the mass relative to the respective diaphragms 12, 32 by means of the spherical mounting surface 5.

Two small pot-shaped casings 18, 28 having flanges are screwed on to the sides of the casing 1, the surface of said cases being increased by cooling ribs 19. Sources of light 20, 25, respectively, are screwed on to the inner bottoms of said cup-shaped casings 18, 28. The screws serving to fix said sources of light are arranged in slots 22 so as to allow for a vertical displacement of said sources of light.

The casing 1 possesses windows 23 permitting the passage of rays of light. Said windows are provided with heat protecting glass plates 24, 34 for shutting off the interior of the casing 1 from the respective chambers of the lamp casings 18, 28.

The mode of operation of a gravity meter according to the invention is described in the following. At a displacement of the mass 3 the diaphragms 17, 27, respectively, rigidly connected therewith are displaced along with it relative to the diaphragms 12, 32, fixedly arranged in the casing 1. This results in a variation in the exposure of the photo-cells 11 corresponding to the relative displacement of the diaphragms 12, 17 and 32, 27, respectively. Such variation is transmitted by the photo-cells as an electric impulse, which constitutes a measure of the displacement of the mass 3 and therefore of the force of gravity.

As the distances to be determined in this way are exceedingly small, it is essential to eliminate as much as possible the possibility of the diaphragms, photo-cells and especially the spring from being influenced by temperature conditions. To this end the heating effect of the lamps 20, 25 arranged outside the casing 1 is diverted by means of the cooling ribs 19. In addition the circulation of heated air in the interior of the casing 1 is prevented by the windows 24, 34, the glass of which is of a non-conducting kind as regards heat.

The photo-cells 11 and the diaphragms 12, 32 and 17, 27, respectively, are adjusted by displacing the respective diaphragms 12, 17 and 32, 37 relative to the respective lamps 20, 25. The vertical position of the diaphragms 12 and 17 corresponds to the zero position of the mass 3. The inner diaphragms 12, 32, respectively, are shifted into the position required for differential connection by vertical displacement of the respective slides 10, 30 in the frames 9, 29. In order to effect parallel adjustment of the diaphragms, the inner diaphragms 12, 32 are turned in the respective recesses 13, 33 in the slides 10, 30.

Additional appliances are further provided for eliminating the influences exerted on the measuring operations by inclinations of the instrument. At an inclination of the casing 1 the diaphragms 17, 27 rigidly fixed on the mass 3 are displaced relative to the respective diaphragms 12, 32 as the mass is pendulously suspended. Such a displacement, however, must not be permitted to cause variations in the exposure of the photo-cells 11, i. e. to simulate a displacement of the mass 3 as being due to differences in gravity. To this end the perforation is not arranged rectilinearly but in circular arcs, the center of these arcs being the fictitious pivot point of the pendulously suspended mass 3. In addition the width of the slides of the movable diaphragms 17, 27 is so chosen that there is no possibility of the diaphragms 12, 32 being uncovered by the respective diaphragms 17, 27 at a lateral displacement of these due to an inclination of the instrument.

The above mentioned means do not however suffice to render the instrument unresponsive to inclination. This can only be achieved by ensuring that the movable diaphragms 17, 27 at a displacement of the mass 3 due to inclination of the casing 1 if at all possible do not move vertically to a plane determined by the perforation of the respective diaphragms 12, 32 and the lamps 20, 25. Such a plane is formed for instance by the edge of a slot of the diaphragm 32 and the center *m* of the lamp 25. Thus, at an inclination of the instrument the controlling edge *b* of the diaphragm 27 would have to be displaceable only in this plane determined by *a* and *m* or in one parallel thereto.

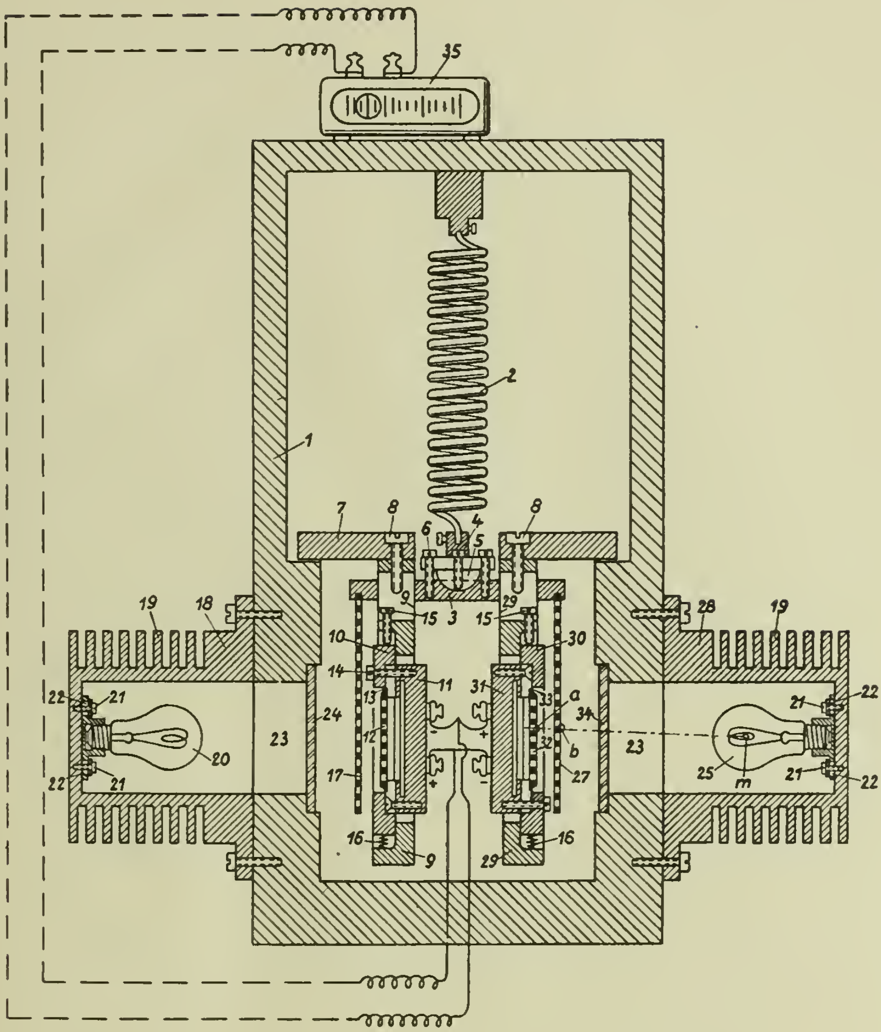
Now the spherical mounting appliance 5 having set screws 6 is provided to effect the adjustment of the respective diaphragms 17, 27 as thereby the latter may be mounted in a position inclined relative to the spring axis with the result that errors due to inclination may in the course of practical application be reduced to a minimum. Finally, a supplementary adjustment may be effected by displacement of the plane *a*—*m* by shifting the point *m*, i. e. by vertical displacement of for instance the lamp 25 by shifting same in the slot 22 of its mounting.

ANTON GRAF.

PUBLISHED
MAY 25, 1943.
BY A. P. C.

A. GRAF
GRAVITY METER
Filed Feb. 4, 1941

Serial No.
377,395



Inventor:
Anton Graf

By A D Adams
Attorney

J